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ACCIDENTS FROM MISPLACED SWITCHES AND DRAW-BRIDGES.

BY WM. S. HUNTINGTON.

[Written for the AMERICAN RAILROAD JOURNAL.]

IN discussing the causes and means of prevention of railway accidents it should always be borne in mind that the old adage, "lightning never strikes twice in the same place," has frequently led to trouble. The idea is common among men that accidents are not liable to be repeated in kind; and if something serious has occurred they reason that in the common cause of events it is not likely to happen again, and no precautions are taken to prevent a recurrence. They follow the teaching of another foolish old saying, viz.: "It is of no use to lock the stable after the horse is stolen." So far as that particular horse is concerned a lock on that stable would be of no particular benefit; but other horses would be very likely to occupy the stable and a lock would be in order as a means of safety. The owner might reason from the same standpoint that some railway officials do—that it is only about once in a lifetime that a man has a horse stolen, and as he has already lost his there is no sense in his squandering money for a lock.

Some years ago a serious accident occurred on a New England road at a misplaced switch. Immediately thereafter the inventor of a safety-switch called on the superintendent full of the feeling that it is an ill wind that blows good to no one, and firm in the belief that the accident would result to his advantage. On his return to his headquarters he was met by his anxious partner, who had called on the superintendent and offered his wares previous to the disaster. "Well, what luck?" queried the part owner. "Would you believe it?" exclaimed the disappointed genius, "the old duffer said that such disasters did not occur very often, and it would doubtless be a long time before they would experience the like again. Indeed, he believed it would never happen again, for such accidents were rare." "So you didn't make a deal," remarked the part owner. "No. What did he say to you when you called on him?" "Well, he said they didn't need any safety-switch. They had had no serious run-offs at switches since he took charge of the road, and he had been there nearly a year. He employed none but reliable switchmen and trainmen, and he had no use for patent safety-switches."

The above was formerly a common experience with inventors of safety-switch and draw-bridge fixtures, but that style of reasoning is giving place to a belief that like causes will produce like effects *ad infinitum*, unless preventives are resorted to, and one disaster is no longer regarded as a guarantee of safety in the future. It is only a few months since the third of a series of draw-bridge disasters occured by which as many trains were destroyed at the same place and all within a few years. What action will be taken by the management of that road now, after three strokes of lightning in the same place, is not known, but it is very likely that some measures will be adopted to prevent further slaughter in that locality. At all events, the past experience of American railway officials points unmistakably to the fact that it is unsafe to monkey with fate, and that there is genuine economy in locking the stable even after a horse has been stolen; but it is better to avoid tempting the thief in the first place by leaving it open. But this sermonizing will be closed by saying that there are not a few who act on the belief that as they have never experienced an accident it is a tolerably sure thing that they are Fortune's favorites and need no precautions, or, having met with misfortunes, have suffered their allotted share of mishaps and are henceforth secure from harm.

Chief among the preventable causes of accidents is the misplaced switch, the causes of which are popularly supposed to rest wholly with employés. Much of American railway practice has placed an unlimited amount of responsibility on switchmen and train-hands as well as yardmen, and the wonder is not that there are so many switch accidents but that they are not more frequent.

Accidents from misplaced switches are of two classes. One causes derailment and the other does not, but some of the most terrible collisions on record have been caused by the latter. The former class can be entirely prevented by the use of some of the safety-switches now in successful operation on some of the best managed roads, but to prevent the latter opens a field for the exercise of some ingenuity. The safety-switch prevents derailment of trains moving in a direction that would cause them to go through the frog (or frogs, if at a three-throw switch) before reaching the head of the switch; that is, if coming out of a siding and the switch is set for the main track, or *vice versa*, the safety-switch would prevent derailments in either case, but it is obvious that a train moving in the opposite direction (running toward the point of the frog) must follow the lead of the switch-rails to whichever track they are set for and this leads to a collision. If a train takes a siding either to meet or pass another train, or to allow another train to pass, and the switch is not turned back to the main track, a collision occurs if a train is following. For this there is no preventive in general use other than the vigilance of switchmen and trainmen. Lights and semaphores, balls, etc., that are arranged to show the position of the switch by night or day, are only a partial protection. They are either misunderstood or the vision is obstructed by fogs, storms or darkness, or they are frequently passed unheeded, and when vision is wholly depended upon no amount of display of signals is reliable at any time as a means of safety. In most if not in all cases of the kind under consideration the responsibility

is too much divided, and, as is too frequently the case, the responsibility rests nowhere. In case of trouble the engineer asserts that he obeyed the signals but they were wrong; the swichman or bridge-tender state to the contrary; then the station-agent or some of his assistants, or the yardmen, the conductor of some other train, or some brakeman, or trackmen, or passer-by had been told or requested to set the switch or signal, and either forgot it or supposed someone else had done it or was going to, and the responsibility vanishes into thin air. Again, station-agents are held responsible for the shortcomings of trainmen who leave open switches behind and before them, and while they (the over-worked agents) are attending to one duty another is neglected, and every one is nominally accountable for his own acts or failure to act and the failure of others, and there is an air of uncertainty throughout the whole management. And it somehow happens that when the verdict at an inquest places the responsibility it usually rests on the oldest and most reliable man in the company's employ, and we have daily proof that the human machine is wholly untrustworthy and should not be burdened with excessive care and responsibility.

It is better to bring automatic machinery to the aid of brain and muscle than to incur the risk of a disastrous failure of the latter. When machinery is kept in perfect working order it performs its duty with unerring accuracy, and an automatic signal can be arranged that will effectually prevent collisions at misplaced switches. But this must be effected through audible signals worked automatically and connected with the switch. Either an explosive on the rail or an electric bell or gong in the cab would rouse an engineer out of a reverie and bring him to a realizing sense of his danger on the instant, whereas he might (as they frequently do) pass lights or targets unheeded. Torpedoes can be placed on the rail by connecting small cables with the switch and extending them to a safe distance, and intermediate signals may be placed at neccessary points. This, and electric signals, have been tested sufficiently to prove their reliability, and the former is so cheap as to be afforded by the poorest railway companies in the land, and they are the very ones which cannot afford to forego their use.

Some of the automatic signal apparatus is objectionable on account of being delicate and complicated in construction and liable to derangement; but these appliances are becoming more simple in construction, and, if properly cared for and kept in good order are more reliable than any human agent, and with these audible signals and safety-switches there are very few if any switch accidents, and the same will also apply to draw-bridges. Although accidents from open draws do not appear to be very frequent the record shows thirty-six for the past ten years, and doubtless the loss of property and hindrance to traffic arising from either disaster (not to mention the loss of life and limb) would have covered the expense of providing all the misplaced draws with safety appliances.

The number of serious derailments from misplaced switches in the United States during the nine years ending in 1883, is reportedby the Massachusetts commissioners at 685; the number for the latter year being 92, increased from 54 in 1877-78, and from 79 in each of the two years previous to 1883. There is no reliable account of the number of collisions from this cause, but they, like derailments, are on the increase in greater ratio than mileage or number of trains, which is discreditable to American railway management. Some officials may object to the use of safety appliances on the ground of derangement, but there are those that have a "tell-tale" attachment showing at a glance when they are out of order, and they should be investigated and tested by all progressive railway officials.

WHEN SHOULD A CAR GO TO THE PAINT-SHOP?

BY A MASTER CAR-BUILDER.

[Written for the AMERICAN RAILROAD JOURNAL.]

THE railway manager frequently has to decide this question independently of the advice of the car-builder or car-painter, and too frequently trusts to luck for a correct answer. Commonly the car is made to run the regulation number of months before it is allowed to go in for painting. No distinction is made between those cars painted by the company and those finished at contract shops. All must stand a like amount of wear. The only exception is when a car begins to look particularly dingy and disreputable.

When traffic is brisk and rolling-stock scarce, a good excuse is found for prolonged service, and ignorance in regard to a few fundamental facts concerning painting frequently causes much loss to the company. Long and severe usage may, in some cases, do a car little or no harm. In other cases a short exposure may do great damage to a car and shorten its lifetime.

One of the most important uses of paint or varnish is to prevent moisture from reaching the vital portions of the car. If the wood be properly filled as a foundation, varnish alone will answer. Accepting as an axiom the proposition that wood when subjected to alternate wetting and drying decays with great rapidity, we reach the conclusion that the important function of varnish or paint is to exclude moisture from the frame, etc. It follows, therefore, that as long as dampness is kept out, the car is safe to run without danger of permanent injury. When this cannot be done and moisture begins to penetrate behind the panels, the car is liable to rapid decay.

In inspecting the painting and varnishing of a car for the purpose of deciding whether it must go to the shop, the general appearance may, in cases of emergency, almost always be neglected. The first points to be examined are the window-sills and their junctions with the panels and mouldings, and next the points where the battens touch the panels. If the varnish has cracked here and the paint has opened so that the continuity of the protecting surface is destroyed, order the car to the shop. If at those points paint and varnish are still continuous and keep out the water and beating of rain, the car may safely run, because the frame is protected.

In casing of pressing need of rolling-stock it is by no means necessary to put a car into the shop for entire repainting or even for revarnishing. The cracks can be stopped in a short time and the car made fit to stand a considerable length of service. It is often a matter of

economy not to paint a car even when the varnish is gone and the paint itself is getting in bad condition. A few days expended in making the cracks tight will frequently put a car in condition to run for months. The expense of this is small.

It sometimes happens that a car not six months from the shop shows these cracks while the varnish is still bright and the color unfaded. In such a case send it to the shop. Order it to be made tight. This can be done in a short time. New cars, from the shrinkage of the wood and a general settling down to their bearings, are especially liable to the cracking of the paint and varnish. When the car goes to the shop ample time will be given for "taking up slack," tightening of truss-rods, nuts, braces, etc. Neglect of these precautions is likely to result in a rapid deterioration of the frame. It will "work," and by its very motion grind itself out at certain vital points and, at the same time, from the entrance of moisture around the windows, will decay quickly.

A passenger-car frame when well made, if protected from the weather and its bolts, nuts and truss-rods looked after, will last in first-class condition for twenty years or more. Yet the strength of the same frame may be destroyed in five year if moisture finds access to it.

By a few inexpensive but very necessary repairs at the right time cars can be kept sound even when the panels appear to be laughing through paint whose original color cannot be distinguished. Such cars can usually be stripped inside and out, and at a small expense converted into neat and serviceable stock good for many years wear. Similar cars, if neglected, will be found too badly rotten in the frame to be worth new panels when only ten or eleven years old.

Bearing these facts in mind, rolling-stock in time of need may be subjected to long and severe usage with repairs occupying but little time and of insignificant expense.

RAILWAY MEDICAL SERVICE.

BY S. S. HERRICK, M. D.,
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[Written for the AMERICAN RAILROAD JOURNAL.]

SECOND SERIES.—THE UNITED STATES.

IV. THE DENVER AND RIO GRANDE RAILWAY.

THE medical department of the Denver and Rio Grande Railway is presided over by a senior surgeon, residing at Denver, assisted by about forty local surgeons at various points along the lines. Fixed salaries are paid to all. Compensation by a fee-bill was at first tried with local surgeons but was found to work unsatisfactorily in a country so sparsely populated. They report monthly to the senior surgeon.

On April 1st, 1883, regulations were adopted creating a hospital fund by the deduction of 50 cents per month from the wages of all employés. They became accordingly entitled to medical attendance and medicines, or admission to the company hospitals, when sick from diseases contracted while in the company's service, or suffering from injuries received in line of duty. Those affected with trivial ailments are always treated as out-patients, and no one remains in hospital more than four months without consent of the senior surgeon or general manager of the road. Any man desiring treatment must bring from the superintendent or foreman a certificate addressed to the nearest company surgeon, stating the circumstances of his case, and the surgeon will then use his discretion whether to attend the case or forward him to hospital. The benefits of the fund are not granted to the subjects of venereal disease or of affections resulting from intemperance, vicious habits, or old diseases contracted prior to entering the service of the company; nor to those suffering from small-pox, inasmuch as free vaccination is offered to all. The senior surgeon has discretionary power to discharge from hospital and from the benefits of the fund those who would become a burden by reason of chronic disease, and those inmates who become intoxicated or otherwise disorderly.

The hospitals used by the company have been civil hospitals located at Denver, Pueblo, Salida and Durango in Colorado, and Salt Lake in Utah. A hospital has recently been built at Salida, partly from the hospital fund and partly from a contribution by the company. It is designed to erect another at Denver. After this it is intended to place the surplus funds at interest and apply the revenue to the relief of disabled employés, since a surplus of about $25,000 has accumulated in two years of prudent management.

I have before me a statement of receipts and disbursements of the hospital fund for the fiscal year ending March 31st, 1885. There was a balance on hand of $17,036.09 March 31st, 1884. The receipts during the year amounted to $28,236.35. The disbursements for the same time were $21,365.28. The number of sick and injured employés treated at the various hospitals was 476; as out-patients, 4,490. Average cost of patients in hospital, $17.85. Average cost of out-patients, $4.30.

It is also contemplated to create an insurance fund by monthly contributions of 50 cents from the wages of employés. This is to entitle them to an allowance of $25 per month for time actually lost from injuries received in line of duty, or $300 for loss of a foot or hand, $500 for total disablement, or $800 payable to their heirs in case of death. Employés of the company are to have the first privilege of borrowing from this fund, at 6 per cent interest on good security, for the purpose of securing homes. On adoption of this plan all classes of employés will be subjected to careful physical examination. At present the examination includes only men who run on trains, but it is unusually thorough for this country, having reference not only to integrity of the organs of sight and hearing, but also to those conditions of constitution and health which would disqualify one for acceptance by a life insurance company.

A peculiar feature of this company is the provision of a medicine chest to be in charge of the conductor of every train. This contains laudanum, ammonia mixture, styptic collodion, bicarbonate of soda, styptic cotton, needles with chamois, saddler's silk, wax, sponges, adhesive plaster, bandages, lint and scissors. Printed directions are added, illustrated with wood-cuts.

No provision is made for medical attendance of the families of employés. This is a desirable feature, and

might be carried out through the local surgeons, as indicated in the previous article.

The personal hygiene of employés and the sanitary condition of railway-carriages, buildings, grounds, etc., are "only partially" made subjects of medical attention.

The company has no regulations relative to transportation of live-stock, beyond what state laws require.

The information required for this article has been furnished by the chief surgeon, Dr. F. J. Bancroft, by whose zeal and executive ability the medical service of the Denver and Rio Grande Railway Company is rendered, in my judgment, the most efficient in the United States.

FAST PASSENGER-LOCOMOTIVES.

BY T. EVERETT AUSTIN.

[A Paper read before the Engineers' Club of Philadelphia.]

THE proper design for a locomotive that should be capable of developing a high speed (of say 60 miles an hour) under ordinary conditions of travel, and that should be both economical and powerful in practice is a problem that has engaged the attention of engineers and master mechanics of railroads from the time of the "Old Ironsides" until the present day. Some of the more recent efforts in this direction have been the Fontaine locomotive of glorious memory, and the "Baldwin Bicycle." Turning to those that are to-day doing good service, we might mention first, what the *American Machinist* of January 7th, 1882, calls the swiftest American locomotive, and from which issue the following description is taken:

"With the rapidly increasing passenger-traffic upon the railroads in this country has also come the necessity of increased speed, and to-day all the railroad companies controlling trunk lines are striving with each other to see which can make the best time with express-trains.

"The Master Mechanics' Association have a standing committee appointed to determine which is the best form of passenger-locomotive. The locomotive-builders are also exercising their brains actively in endeavoring to produce a locomotive that shall combine power, speed and economy, three essential requisites in accomplishing the service desired. * * * A locomotive lately built by the Baldwin Locomotive Works of Philadelphia, for the Central Railroad of New Jersey. * * * This locomotive is considered by its builders to be their best design. * * * Four locomotives * * two with 18 × 24-inch cylinders, and two with 19 × 24-inch cylinders are now running. * * In general appearance it * * resembles the usual style of first-class eight-wheel locomotives, but with some very important improvements. In order to supply steam to larger cylinders, a larger furnace, more heating surface and greater boiler capacity are required. In the ordinary passenger-locomotive the boiler sets inside the frame, and the necessary water-spaces at either side of the fire-box greatly reduce the width of it. These water-spaces are made as small as is considered safe, in order to get the necessary grate surface; to overcome one evil another is introduced, and since the introduction of anthracite coal as a fuel upon locomotives, a larger heating surface is required; at first only the best quality was used, but lately coal dust has been successfully burned to some extent. * * * Boilers have recently been placed upon the top of the frames which admits of their being made as wide or wider, if necessary, than the outside of the frames. This improvement admits of a wider fire-box and larger water-spaces, but the boilor sets higher, and the depth of the fire-box is very much reduced."

The following are some of the principal dimensions: Gauge of road, 4 feet, 8½ inches. Boiler material, Otis steel, ⅜ inch thick. Shell 52 inches diameter. Style, wagon-top. Fire-door, 16 inches diameter. Dome, 32 inches diameter. Fire-box, 125⅞ inches long × 43¾ inches wide. corrugated sides. Depth, front, 51¾ inches; back, 42½ inches. Crown sheet, ⅜ inch thick. Tube sheet, ½ inch thick. Sides ¼ inch, and back $\frac{5}{16}$ inch thick. Water-spaces, front, 4 inches. Sides and back 3 inches. Crown bars 5 inches × ¾ inch, placed 1½ inch above crown. Crown bar bolts ⅞ inch, screwed through sheets with nut below. Combustion-chamber 35 inches long. 200 tubes 2 inches diameter × 11 feet 5⅞ inches long, No. 12, wronght-iron ends, arranged for copper rings. F. B. end, wrought-iron dry-pipe, 8 inches diameter. Grate water tubes 2¼ inches diameter. Drain grate area 38 square feet. Heating surface in fire-box 145 square feet. In tubes 1,175 square feet. Total, 1,320 square feet. Steam pressure 140 pounds per square inch. Rigid wheel-base 7 feet 6 inches. Total wheel-base 21 feet 8 inches. Weight in working order 93,000 pounds. Cylinders 18 inches diameter × 24-inch stroke Driving-wheels 68 inches diameter. Driving-axle, Otis steel journals, 7½ inches diameter × 8½ inches long. Smoke-stack, straight 16¾ inches diameter × 14 feet 10 inches height above rail. Truck, four-wheel swing bolster, 32 inches diameter of wheels. Journals 5½ inches diameter × 8 inches long.

Class K, Pennsylvania Railroad locomotives, were designed to run in opposition to the engine just described; and while they give very good results for an ordinary eight-wheel American locomotive, do not, I understand, equal in performance and economy all that might be expected of them.

The general designs of these engines are probably so well known to the members of the club as not to require description. Some of the dimensions are: Gauge of road, 4 feet 9 inches. Cylinders 18 inches diameter × 24-inch stroke. Drivers 78 inches diameter. Driving-wheel journals 8 inches diameter × 10½ inches long. Total weight 92,700 pounds; on drivers 65,300 pounds. Wheel-base, rigid, 7 feet 9 inches. Total, 22 feet 7½ inches. Wagon-top boiler 50 inches diameter, 201 tubes 1⅞ inches diameter × 10 feet 10¼ inches long. Fire-box 9 feet 11⅞ inches long × 3 feet 5¾ inches wide. Grate surface 34.8 square feet. Heating surface in tubes 1,005 square feet. In fire-box 120 square feet. Total, 1,305 square feet. Engine-truck, four-wheel rigid bolster wheels, 33 inches diameter. Journals 4¾ inches diameter × 7½ inches long.

Turning next to the "Wooten" passenger-locomotive, designed for the same service, we find the dimensions of type D 33 to be: Boiler 53 inches diameter at smallest ring, tapering back to 58¾ inches at joint of fire-box.

Fire-box 8 feet 6 inches long × 8 feet wide inside. Combustion-chamber 31 inches long; 345 tubes 1½ inches diameter × 9 feet 2 inches long. Grate surface 68 square feet. Heating surface tubes 1,232 square feet, Fire-box 151 square feet. Combustion-chamber 32 square feet. Total, 1,415 square feet. Cylinders 18½ inches diameter × 22-inch stroke. Drivers 68 inches diameter. Rigid wheel-base 6 feet 5 inches. Total wheel-base 20 feet 5½ inches. Stack 18 inches diameter. Weight on drivers 60,780 pounds. Total weight 89,750 pounds.

The "G. F. Ward," for the New York, Providence and Boston, and the "Pegasus," for the Boston and Lowell Railroad, will illustrate the best practice of the high speed engines of the Rhode Island Locomotive Works. These two engines are nearly alike, the dimensions being: Track gauge, 4 feet 8½ inches. Cylinders 18 inches diameter × 24-inch stroke of piston. Boiler 52 inches diameter; 184 tubes, 2 inches diameter × 142¾ inches long. Fire-box 71¼ inches long × 34 inches wide. Drivers 72 inches diameter. Rigid wheel-base 102 inches. Total wheel-base 279 inches. Engine-truck, four-wheeled swing bolster wheels, 33 inches diameter. Weight on drivers 59,000 pounds. Total, 91,000 pounds.

The recently finished Mason passenger-locomotive for high speed, designed by the superintendent, John T. Meats, has attracted considerable notice in the eastern states. In these engines care has been taken to increase the size of all wearing parts, new cylinders and all other working parts being carefully gone over, and we may expect from these engines as good performances as are possible to be gotten out of the standard American type. The dimensions are: Cylinders 18 × 24 inches. Driving-wheels 68½ inches diameter. Rigid wheel-base 9 feet. Total wheel-base 23 feet 4 inches. Weight in working order 102,000 pounds. On drivers 68,000 pounds. Boiler, style wagon-top, 54 inches diameter. Material, steel, $\frac{7}{16}$ inch thick; 212 tubes 2 inches diameter × 11 feet 2 inches long. Fire-boxes 78 inches long × 35 inches wide, 75 inches high. Driving-axle journals 8 inches diameter × 8 inches long. Engine-truck, four-wheeled swing bolster wheels, 30 inches diameter. Journals 5½ inches diameter × 11 inches long.

After the foregoing description of what has been done in the way of fast passenger-locomotives of the standard American pattern, which are acknowledged by all as not filling the bill of what is required in these days of fast travel and heavy trains, the writer would beg to call your attention to the following design for a fast passenger-locomotive. I would state in the beginning that there is, to my best knowledge and belief, nothing in this design covered by a patent, and if it is of use to any one they are welcome to it. We do not claim anything absolutely original in this locomotive, all of the pieces for the most part being "old friends with new faces." Some of the peculiarities of this engine are, first, the twin fire-boxes. Boilers of this style were designed by Mr. E. D. Leavett, Jr., and built for the Boston sewerage engine, and are to-day giving first-class results. The only departure I have made from his design is in using the Belepare top, which makes a better arrangements of stays, and in the divided combustion-chamber which gives a better circulation. Another departure from the American locomotive is in carrying the four-wheel truck entirely in front of the cylinder and connecting to the back driver. The object of this is to get the weight of the cylinders nearly all on the drivers, and so do away with that amount of dead weight, which in ordinary locomotives has to be carried, by placing no more weight on the front truck than is absolutely necessary to make the engine track well. In some cases a pony or two-wheeled truck might be used, but where high speed is required and the track is not perfectly straight, the danger of being derailed is so great with a two-wheeled truck that not many American master mechanics would have the hardihood to use them.

With this style of truck the engine may be run with the same degree of safety as an ordinary eight-wheeled engine. This way of carrying the truck in front of the cylinders is very often used in the old world.

GENERAL SPECIFICATIONS FOR A FAST PASSENGER-LOCOMOTIVE ENGINE.

General dimensions: Cylinders 19 inches in diameter, 24-inch stroke. Two pairs of coupled driving-wheels 6 feet diameter, with a four-wheeled swing bolster truck in front of cylinder and one pair of trailing wheels under fire-box back of drivers. Gauge of road, 4 feet 8½ inches. Fuel, hard or soft coal. Weight of engine in working order, 103,000 pounds; on drivers, 87,000 pounds; on truck, 10,000 pounds; on trailing wheels, 5,000 pounds. Wheel-base, driving 7 feet, rigid, 15 feet 7 inches. Total of engine 29 feet 2 inches. Boiler, cylinder part and outside fire-box, of Otis steel, $\frac{7}{16}$ inch thick, riveted with ⅞ inch rivets, placed not over 2¼ inches from center to center, all seams to be double riveted. Diameter at front end to be 60 inches, made straight with one dome placed on middle of boiler, 32 inches in diameter, and 30½ inches high. Smoke-box, extended, 61½ inches in diameter and 92½ inches long, made of ⅜-inch iron. Fire-boxes to be 8 feet long, 46 inches wide at bottom, and 57 inches deep inside, made of steel. Crown ⅜ inch thick, sides $\frac{5}{16}$ inch thick. Fire-door sheet ⅜ inch thick. Combustion-chamber 38 inches deep, 52 inches wide and 42 inches long. Inside tube sheet ½ inch thick. The sides and crown to be stayed with ⅞-inch stay-bolts, screwed through and riveted over, placed not over 4¼ inches center to center. Water spaces 4½ inches front, 3½ inches sides, tapering to 4½ inches at crown; 4½ inches in center, tapering to 6 inches at crown. Tubes of iron, 200 in number, 2 inches O. S. diameter, No. 12, W. G. thick, 10 feet long, set with copper rings on fire-box ends.

	Square Feet.
Heating surface, tubes	1,040
" " fire-box	200
" " combustion-chamber	50
Total	1,290

Smoke-stack, straight, 18 inches in diameter. Frames of best hammered iron 4 inches wide, with pedestal and braces welded in. Front rails bolted and keyed to main frames, and pedestals protected by cast-iron wedges and shoes, the pedestal being connected at bottom by cast-iron thimbles and bolts. Driving-wheels, four in number, 72 inches diameter. Centers of best cast iron, with hubs and rims cored out, the centers turned to 66 inches diameter for tires to be shrunk on. Tires of best cast steel, 3 inches thick, both pairs flanged 6 inches wide. Driving-axles of best hammered iron; journals, 8 inches diameter, 10 inches long.

RIVAL LAND AND WATER TRANSPORTATION ROUTES.

A CONSIDERABLE portion of the current discussion of transportation questions and other intelligence bearing on such matters, hinges on the conflicting interests of land and water routes.

The magitude of the merchant navy of the United States is discussed in the annual report of the commissioner of navigation, and he directs attention to the fact that it finds employment chiefly in river, inland, lake, gulf, and coastwise traffic. The craft of various kinds includes 6,284 seagoing sailing vessels, of 2,138,880 tons, and 355 steamers, of 545,187 tons. The number of vessels employed in the different coasting trades and fisheries of the Atlantic and Pacific coasts, including the western rivers and all inland navigation excepting the northern lakes, on June 30th, 1885, was 19,123, and their tonnage 2,455,720. Of this number, 13,862 were sailing vessels, 4,111 steam vessels, 256 canal boats, and 894 barges. The total number of vessels engaged in the coastwise trade, excluding those engaged in the fisheries and upon the northern lakes and western rivers, is 15,918, and their tonnage 2,001,917. The commissioner says:

"If we include our lake and river tonnage it is the most formidable coasting fleet in the world, surpassing in point of tonnage the combined mercantile navies of any two nations, excluding Great Britain. In fact, the aggregate merchant tonnage of France, Spain, and Italy together falls short of the United States coasting marine. Moreover, this fleet of coasters of various kinds, built for conducting the traffic of our extended coasts and long rivers, is admirably adapted to the diversified variety of business it was constructed to perform. It is, in point of efficiency and equipment of vessels and accommodations and comforts for those on board, second to no fleet in the world. The coasting service is, moreover, thoroughly American, both in the increasing traffic it is intended to carry on and the peculiar style, models, and rig of the vessels themselves. No doubt the experience gained by our shipwrights and architects in drawing the lines of the fine models that are to be met with along our coasts has enabled them to build yachts that from the days of the *America* to the *Puritan* have kept the prize for fast sailing."

One of the general considerations which has scarcely received as much attention as it deserves is the effect, upon railway interests, of the influences that have confined the operations of American vessels chiefly to the coasting trade, and prevented them for participating extensively in commerce with foreign countries. It is only a comparatively small amount of the coasting trade that could not be conducted by some of the existing railway lines, and that is not now habitually carried on under conditions that necessitate sharp competition. If the available foreign fields for effort were more extensive and remunerative it is probable that they would attract at least some of the seagoing vessels now engaged in the coasting trade, and thus, perhaps, diminish the pressure to which a number of rival rail and water routes are now subjected.

There are also many home industries and classes of traffic which would presumably be more flourishing if the existing facilities for exportation to foreign markets from various domestic ports were improved, and it is possible that some railway lines would derive a double benefit from such an increase of oceanic shipping if it were supplied by vessels that are now engaged in the coasting trade.

It is true that leading ports are generally abundantly supplied with foreign vessels, but exclusive dependence upon them for the management of the foreign commerce of the country involves perils and uncertainties which might under some adverse circumstances become very damaging, and there are at all times promising or possible markets for American products in some parts of the world which will never be fully developed by operation conducted in foreign ships.

This subject has a close relation to the material welfare of the American people. Their prosperity depends, in a very large degree, upon the extent to which foreign markets can be provided for their surplus products, and the existing capacity to produce many useful articles greatly exceeds the existing home and foreign demand. Meanwhile very active efforts are being made by various foreign governments to provide satisfactory substitutes for the articles now exported from our soil. It is necessity rather than choice that makes Great Britain such a large purchaser of American breadstuffs, provisions, and cotton, and her statesmen and many of her merchants would prefer to make corresponding purchases from competing British colonial dependencies if their location and industrial development permitted such a change. What has already occurred in connection with the substitution of wheat from India for the products of our fields may be the forerunner of similar limitations in other directions. France and Germany have also imposed severe restrictions on some branches of our export provision trade. In brief, while we have been materially dimishing the American demand for European manufactures, some foreign countries have been equally successful in checking their imports of staple products of the United States. Instead of looking for a remedy to a reduction of our tariff, which might result in inflicting great injury on our manufactures without materially benefiting our agriculturists, steady efforts should be made to seek new markets wherever they can be found, and this work can never be prosecuted with the desirable degree of efficiency and success while the direction, management, and manipulation of our foreign trade is left, mainly, to and under the control of representatives of foreign interests.

For the reasons stated and other considerations which are perhaps even more cogent, it is highly desirable that practical methods should be devised for the encouragement or increase of American shipping devoted to foreign trade, and on all propositions conducive to this end there is a substantial harmony of interests between the representatives of national railway and water routes.

Various other classes of questions are discussed which embrace issues affecting the historic and incessant rivalry between rail and water lines. No other portion of the world has ever witnessed such struggles as have been waged for the control of many branches of the through traffic of this country. Nowhere else have railways reduced rates to a standard low enough to make them formidable rivals of long water routes. And nowhere else is the anomaly presented of a systematic advocacy of extensive governmental aid to water lines for the express purpose of enabling them to compete more effectively with rail lines built chiefly by private capital.

Illustrations of some of the prevailing tendencies were afforded by statements made during the recent debate, in the House of Representatives, at Washington, on the change of the rules of that body which were finally adopted. They included references to the Hennepin canal, a project that has evidently found enthusiastic ad-

vocates who are anxious that the United States should construct an expensive artificial water channel between the upper Mississippi and the northern lakes. A number of other schemes of equal or even greater magnitude were briefly mentioned, and it is supposed that one of the results of the new methods of conducting the business of the House will be to increase the chances of the success of schemes which aim at securing large appropriations for the improvement or creation of interior water routes. So far as the work of the session has been outlined, the indications point to hostile treatment of some of the land-grant roads, coupled with more favorable consideration than usual of various plans for improving competing waterways.

The utility of a number of the schemes has been greatly magnified. The interior transportation service of the country is performed mainly by the railways, and in all northern sections of the United States their labors are indispensable, on account of the closing of the interior water routes during a large portion of each year. The usual winter blockades have now been established, and in the absence of railway labors, ruinous and intolerable torpidity would reign supreme in many circles which have suffered only a slight diminution of ordinary activity. The course of events on the upper Mississippi, which is typical of most of the northern water routes, is illustrated by a statement that the ice gorged above the railroad bridge at Winona on the night of December 6th, thus closing the season after 247 days of uninterrupted navigation. Five thousand one hundred and twenty-five boats and 1,978 rafts rafts passed the bridge during the season. The *Josie* was the first St. Louis boat to arrive on April 10th, and the last to leave on November 17th. The Mississippi closed at Davenport on December 7th. This is ten days earlier than for the last two years. The season of navigation opened March 21st, three days after the ice went out. The close this year was very sudden, and the ferry, which made regular trips until within a few hours of the ice blockade, had difficulty in getting into winter quarters.

In referenee to the general characteristics of the traffic now conducted on the Mississippi the following statement, attributed to a prominent railway official whose name is not published, is going the rounds of the western press:

"There is not half the benefit derivcd from the Mississippi river that the people are led to believe. The railroad companies carry freight at as low a rate as the boat lines, and besides give better service by fast time and prompt delivery. The boats do very little, if any, through business; it is only local traffic they carry. And what town of any size slong the river is not touched by a railroad? There is a sufficiency of roads to transport all the produce the country furnishes, and the competition among them keeps the rates on a basis with that charged by the boat lines. If the railways did right they would compete with the boat lines while navigation is open in such a way as to surprise them and compel them to tie their boats up to the nearest swing-bridge on the river, and in the winter make the shippers, who were inclined to favor boat against rail, pay such a rate on every article they ship that it would draw the life blood from their hearts. The railroads are in a position to do it if they wanted to. But they were built for public benefit, and they did not apply to congress every year for aid or a certain sum of money to maintain them and make necessary improvements.

"No; when boat lines perform the service of a well-managed road extending along the bank the same distance as boat lines run, then it is time canals were run all over the country, and the first man to mention railroads should be lynched. Of course the Mississippi river is a strip of water owned by the government, and the government does not want to see it become clogged with snags, or mountains growing in its center, or resting places for ducks and geese. No; it must be kept in proper light before the public, especially foreigners, so that the historical Mississippi may appear to them all that has been said of it. If it is kept in an improved condition and boats run regularly between points, the railroad companies do not care, for their traffic is not noticeably diminished by the competition. None of the companies owning a line of boats running between St. Louis and St. Paul find them paying. I'll bet you they are losing money every day, but continue to run in the hope of better times. There is no through business between St. Louis and St. Paul to speak of, and the result is that the boat lines depend almost entirely for the trifling business picked up between points, for which they ask what a railroad man would call a very remunerative rate. This is why we do not believe in congress appropriating money for the improvement of waterways, because it really does not benefit the country tributary to the point where the improvement is made when there is a railroad in that district, for the railroad can carry all the business at as low a rate in the end to the shipper as the man owning the boat can. This, then, is only beneficial to the few individuals who own the boat transportation lines, and when congress makes an appropriation for the opening of canals and rivers it is for the benefit of a certain few individuals who wish to embark in new enterprises aided by the public."
—*Railway World.*

Comparative Cost of Operating American and English Railways.

IN a paper read at the October meeting of the American Society of Civil Engineers, Mr. E. B. Dorsey gave the following facts relative to the comparative cost of operating railways in this country and in England:

The roads north and west of London pay on an average 6s. 8d., or $1.60 per ton of 2,240 pounds, and roads running south of London 12s. 6d., or $3 per ton, which price is that of the coal delivered to the railways. The wages of engine-drivers and firemen in England average 6s. 8d. per day, equal to $1.60, and in America $3.60, while the latter in England average 3s 9d., or 90 cents, and in America $1.90. To equalize the comparison of operating expenses, then, coal should be assumed in the United States at $1.60 per ton, and the scale of wages reduced 45.5 per cent.

Then, again, the English railways are considered so much smoother than the American that the engines ought to show favorably on the repair question; but in spite of all, the average cost of repairs and renewals of locomotives on fourteen railways in England came to 7.8 per cent. of the total operating expenses, while on eight American railways it was 5.7 per cent., or one-third less. This goes to show that the outside-cylinder engine (American type) does not wriggle herself to pieces so much as she was thought to do. As labor is the chief expense in railway repairs, the wages in the United States should be reduced 50 per cent. to put the comparison above on its merits, which gave 4.3 per cent. for American engines against 7.8 for the English, nearly one-half.

In regard to maintenance of way the average cost on fourteen English railways was 17.8 per cent. of total operating expenses, and on the eight American railways 21.6, or 4 per cent. more. This does not take into account the difference in wages between the two countries.

In regard to passenger-cars the cost of renewals is about the same, being $1.27 in England as against $1.34 in, America per 1,000 passenger-miles; but it must here be considered that 86 per cent. of English travel is third-class, where first cost and repairs must be very small, and it is fair to say the renewals and repairs of first-class cars must be at least three times the cost of repairs and renewals in America. In regard to motive-power Mr. Dorsey has been surprised to find it was nearly double

in England as compared to America, for he had expected the reverse. To ascertain if it was not accidental, as he had based it on one year's business, he has constructed a table, which shows comparisons for 1882, 1883 and 1884. The English roads selected are five doing the heaviest traffic, and those of America, with the exception of the New York, New Haven and Hartford, run through a country with greater natural difficulties. In Massachusetts the coal costs from $4 to $5 per ton, and again the question of wages should come in with its 50 per cent. reduction.

Supposing, he says, that the largest ton and passenger haulage of the American lines influenced the result in their favor, the same calculation on the same basis, except the taxes are included in operating expenses, has been made for 1884 on many of the short railways of Massachusetts where the average haulage is very small. The results of the workings of these small, short railways are still more favorable to the American system.

From the superficial observation it is difficult to say what is the cause of this great additional cost in motive-power in operating the English railways when it should be much less than that of the American railways, owing to their average superior construction, with easier grades and curves. Apparently the most prominent cause of this increased cost is the great speed and small tonnage of the freight-trains. Perhaps the American bogie rolling-stock runs with less friction than the rigid wheel-base rolling-stock used on the English roads. It would certainly pay the management of the English railway companies to investigate the cause of the extra cost and if possible remedy it. If this can be done they will be able to decrease the operating expenses over 8 per cent. without making any changes whatever in the present prices. This will enable most companies to increase their dividends largely, probably over 4 per cent. For what is done in the United States ought to be done in the United Kingdom.

It is claimed that English government taxes and duties are onerous; they were found to average 7 per cent. of the operating expenses in England and 5 per cent. in America, and further, that the English charges for passenger travel are about double the American.

State Ownership of Railways a Failure.

THE experiment of buying out the private railways, which has been tried by the German government with such apparent success, has not been attended with anything like equally satisfactory results in Austria and Hungary; and these latter countries have decided to stop, for the present at least, the acquisition of railways by the state. The railway work of the present parliament will be limited to the two bills for purchasing the Prague-Dux and Dux-Bodenbacher lines which have been a long time in preparation, increasing the rolling-stock of the state lines, authorizing additional capital for the Austrian Northwestern railway, and passing a new law for local lines. Even the two bills in question are strongly opposed by the railway committee itself. It is said that the extension of state lines should be postponed until the question of state ownership in railways was decided. As a matter of fact there is nothing to wait for, as it is already clear that the results shown by state lines will be worse this year than last, a 2 per cent. dividend on the capital invested being the utmost that will be earned. The outlook being thus very discouraging, there is already some talk in well-informed circles of handing over the state lines to private companies again, thus clearly demonstrating the utter failure of the system. Under these circumstances the suggestion of the Gratz chamber of commerce that the state should purchase the South Austrian railway will produce no results.

The question naturally arises, says the London, (Eng.), *Railway Times*, why is the system of state railways such a failure in Austria and so successful in Germany? The answer is that the latter country's success is only apparent. Germany's credit is much higher than that of Austro-Hungary, and as the owners of private lines were paid in government bonds the state made a much better bargain than is possible in the dual kingdom, so that a financial success is more easily shown in the fatherland, but at the expense of the public. The German government, as owner of all the great lines and possessing the monoply of both goods and passenger-traffic, has been able to economize in many directions by running fewer trains, raising rates, providing less comfort and accommodation, etc., quite regardless of the public who have no choice but to use the state lines. This disregard is proved by the fact that letters from London are only delivered once a day in Berlin while Frankfort-on-the-Main has two deliveries. Formerly Berlin had also two, but now that all the eastern lines are state property, while to Frankfort there is a competing private line, things are changed. Such a state of things is impossible in Austria, where the press would raise an outcry that would soon put a stop to such manœuvers; but in Germany nobody dares to say a word when once Prince Bismarck, the originator of the state railway system, has made up his mind. That the German practice must injure the trade is obvious, and it is equally clear that without crippling commerce and putting passengers to discomfort and inconvenience the state lines cannot pay. It appears, therefore, that this much praised system is an imposture and it is to be hoped that other countries will profit by the lesson taught them by Germany and Austria.

The Waste of Whistling.

THE nuisance of the steam whistle in populated neighborhoods has been frequently mentioned, says the *Scientific American*, and in some localities municipal ordinances and railway managements have restricted its use. But it is seldom that the cost, expense, and waste of the steam whistle is mentioned. And yet the blowing off of steam through locomotive whistles alone must entail an enormous waste of fuel. Steamboat whistles and the utterly useless stationary engine whistles must make, in the aggregate, an enormous waste to the purchasers of fuel for steam-boilers. From recent reports it is seen that there are 1,940 grade-crossings in the two states of New Hampshire and Connecticut. Probably not less than an average of twelve trains cross these roads daily; at each a locomotive whistles under a pressure of about 110 to 120 pounds the square inch. The aggregate amount of steam thus blown off into noise is very great.

The steam from a whistle escapes in an annular space

around the bowl; and if the whistle is six inches in diameter and the annular space is only one thirty-second of an inch wide, the total escaping space will be more than one-half square inch. That much steam is required to supply a steam whistle is evident from the fact that all steam whistles have for their connecting stems very generous steam pipes: and also from the fact, patent to every observer, that as dense a cloud of vapor is formed from the steam of the whistle as that escaping from the safety valve in the same time.

The superintendent of one of the most important railways in the country, himself a practical engine-driver, says that when he was a locomotive engineer he was requested by the committee of a local political demonstration to toot his whistle persistently as he approached the depot from a point nearly a mile from the station. He did so, and ran his steam down so that his passengers had either to walk from the stationary train or wait until steam could be gotten up. The writer once in whistling two refractory oxen off his road ran his steam down from 120 to 80 within less than two minutes, and the fireman piling in the wood all the time. The superintendent to whom reference has been made believes that for the time the ordinary steam whistle is used, more steam is required than is used for driving the locomotive with its double cylinders and pulling a train of cars. The whistle demand of steam is a constant one during its use—not intermittent like the admission of steam to an engine cylinder: and the size of the pipe—not less than one and one-half inches—permits a very large amount of steam to escape under a pressure of 120 pounds to the square inch. This authority, with others of practical knowledge, says that thirty-five cents per day for the tooting of steam whistles on running trains is a very low estimate of the cost. This does not include depot yard work. And no estimation is conjectured as to the waste of steam and cost of fuel for the steamboat and steam-tug whistles and those of stationary boilers. But for exactive legal enactment and obstructive legalized orders, much of the useless waste of whistling and much of its abominable annoyance could be stopped and abated.

A still more exact statement is that of a well-informed railway man, who says that the expenditure of fuel for each locomotive on the New York, New Haven, and Hartford road each day is about one-eighth of a ton; this only for the legally required soundings at grade-crossings. This would make for this one road, the cost of fuel, for grade-crossing whistling alone, not less than $15,000 per year.

A Locomotive's Surprising Record.

LOCOMOTIVE No. 137 on the Boston and Albany Railroad, used in the passenger-service, has a very remarkable record. It came out of the shops new April 23rd, 1883, and on October 30th, 1885, was sent in for general repairs, having in the meantime—for 30 months and seven days—made daily trips. The average run for the 921 days was 203 miles, or an aggregate of 184,726 miles. During this time only 12 days were lost for repairs, and no repairs were made until April 27th, 1884, when the engine had run 78,812 miles. During portions of the months of April and June and the whole of the month of May, the engine ran 400 miles every day, making (with extra trips Sundays) 10,910 miles in May, and a total of 26,740 miles in the three months named, or an average of 8,913 miles per month. The 12 days lost for repairs were distributed over the period from April 27th, 1884, to October 30th, 1885, and, in almost every instance the repairs were of an unimportant character and in the shape of renewals.

The driving-boxes of the engine were of cast iron, but have lately been replaced with steel. The weight of the engine is 42 tons, its cylinders are 18 × 22 inches, its driving-wheels 68 inches in diameter, and the boiler 52 inches in diameter. There are 231 two-inch tubes, and the steam-pressure is 160 pounds.

A New Adaptation of Electricity.

TELPHERAGE is the name which has been given to a system of automatically transporting goods by the agency of electricity as the motive-power, which system was the invention of the late Professor Fleeming Jenkin. Dying in June last, however, the professor did not live to see his ingenious ideas carried out on a practical scale. He had begun the construction of a telpher line on the estate of Lord Hampden, at Glynde, near Lewes, but his plans had to be perfected by Professor Perry, his successor as the engineer to the Telpherage Company. This line has been completed, and was formally opened on Saturday, October 17th, by Lady Hampden, who electrically started a loaded train on the line. A special train conveyed a large number of visitors from Victoria station to Glynde, among the company being Sir Frederick Abel, Admiral Sir Edward Inglefield, Mr. W. H. Preece and Professor Ayrton.

The line is a double one, nearly a mile in length, and is composed of two sets of steel rods three-quarters of an inch in diameter, supported on wooden posts of T-shape, and about eighteen feet high. The wires are supported one on either end of the cross-piece of the "T," which is eight feet long. The carriers, or skips, as they are technically termed, are iron, trough-shaped buckets, each holding about 2 cwt., and suspended from the line by a light iron frame, at the upper end of which is a pair of grooved wheels running on the line of rods. A train is made up of ten of these skips, which are in electrical connection with each other, and with an electric motor which is placed in the middle of the train, having five skips in front and five behind it.

At a point about midway of the length of the line is the engine-house, in which is a steam-engine which drives the dynamos. From these latter the current is led to the line, and thus to the electrical motor which moves the train. The use to which the line is put is to carry clay from a pit to the Glynde railway siding, whence it is delivered in trucks and transported by rail to the works of the Newhaven Cement Company. At the charging end of the telpher line the skips are loaded each with about 2 cwt. of clay, the train thus carrying one ton. A laborer, by touching a key, starts the train which travels at a speed of from four to five miles an hour along the overhead line to the Glynde station. Arrived there, another laborer upsets each skip as it passes over a railway-truck, into which the clay is thus loaded. This upsetting, however, will eventually be performed automatically by means

of a lever on each skip, which will come in contact with a projecting arm as it passes over the truck. The laborer at the discharging end of the line has full control over the train, and can stop, start and reverse it at will, as can also the man at the other, or loading end.

There are two trains at Glynde, but only one is at present used, that being found sufficient to deliver 150 tons of clay per week at the station—the minimum quantity required by the cement company. The trains need no attention when running, as they are governed to run at the same speed both on rising and falling gradients. An automatic block system is provided, so that as many as twenty trains can be run on the line without the possibility of collisions. The telpherage line at Glynde being the first erected, it is admitted that its details are capable of improvement. It, however, successfully demonstrates the ingenious idea of Professor Jenkin in utilizing electricity as a source of motive-power. Beyond this it can hardly be said to go at present.

High-Speed Engines for English Roads.

ACCORDING to *Engineering*, the Northeastern Railway Company are at present having built at their works in Darlington and Gateshead twenty new engines, to be used solely for express purposes. At the Darlington North Roads Works ten of the engines are to be built. One is already completed. It runs upon four wheels (coupled) and is seven feet two inches in diameter. The diameter of the leading wheels is four feet and six inches and that of the centers eight feet six inches, the total wheel base of the engine being sixteen feet eight inches. The cylinder is eighteen inches in diameter and has a twenty-four inch stroke. The boiler pressure is one hundred and forty pounds per square inch, with total heating surfaces of about 1,400 feet. The tender is upon six wheels of three feet six inches diameter, with steel axles. It will hold 2,800 gallons of water and carry three tons of coal. The general fittings throughout are of the most approved character, and adapted to meet all modern requirements. The weight of the engine with steam up is forty-two tons, and that of the tender, twenty-eight. All the engines are to be of the same type, and are to be called "Tennant's Express Passenger-Engine." They will be capable of running express from York to Edinburgh and *vice versa* in one journey; hitherto it having been necessary to employ two engines to accomplish the same distance. In a trial run of the engine a speed of eighty miles per hour was attained. When the engines are finished the Northeastern will possess engines, for finish, build and general excellence, unequalled in the country.

The Philadelphia and Reading Road.

AT the annual meeting of the shareholders of the Philadelphia and Reading Railroad held in Philadelphia, on January 11th, Mr. Franklin B. Gowen was unanimously elected president. Mr. Gowen retired from the presidency of the road two years ago and was succeeded by Mr. Keim, the receiver of the road. The report of the retiring president gives the followiug figures for the year ending November 30th, 1885: Net earnings of the railway company, $12,652,249; deficit in earnings of coal and iron company, $124,679; for both companies net earnings, $12,527,569. The operations of the railway company, deducting that of the system of the Central Railroad Company of New Jersey, have resulted in: Net earnings, $8,050,983; total fixed charges, including full charge of interest and rentals, $10,244,809; deficit for the year, $2,193,826. The deficit in the operation of the Central Railroad of New Jersey for the year is $1,338,377.

The rumors that have been current since the election of Mr. Gowen to the presidency of the company, that he intended to go abroad again to raise $20,000,000 for the creation of a trust fund to be used in paying off the pressing obligations of the company, and take it from the hands of the receivers, are stated by those who know, to be entirely correct. It is understood that before his recent return to America he spoke to a number of English and German capitalists on this subject, and that he received from them gratifying assurances that, should he succeed in his efforts to replace himself at the head of the company, they would provide the money to carry out his purposes. When questioned on the subject he declined to state whether or not there was any truth in the rumors.

Railways in Iowa.

ACCORDING to the report of the Board of Railroad Commissioners of Iowa for the year ending June 30th, 1885, there are now in that state 7,478 miles of railway in operation. The increased mileage over the previous year is reported at 1,280. The total cost of the roads was $266,784,535.99. The total amount of taxes paid by the railways was $768,274.43; 58½ per cent. of the entire track in the state is laid with steel rails. The gross earnings of the Iowa roads during the year is given at $36,123,587.45, and the operating expenses at $23,093,881.04, leaving net earning of $13,030,096.41. The total stock of the roads is stated as $400,699,755.03, and the total debt as $457,081,918.34. The total number of persons reported as employed regularly in operating the roads in the state is 25,666; the amount paid for their services is $13,628,067.66, or $598,061.25 more was paid for personal services in operating the roads in the state than the net earnings.

Dimensions of Cars used on the Pacific Roads.

THE Chicago, Burlington and Quincy Railroad has sent out the following circular:

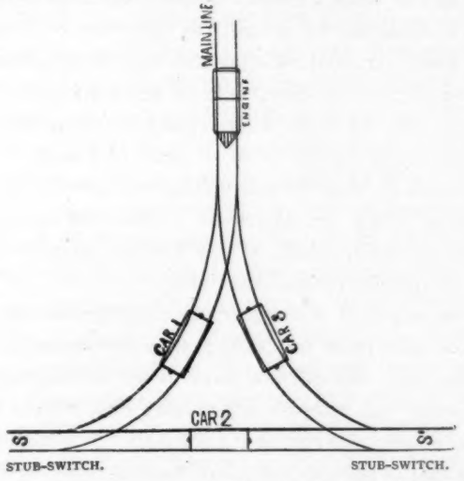
The Transcontinental Association notify us that owing to the natures of grades, tunnels, snow-sheds, etc., the following are given as the maximum outside dimensions of box-cars which it is safe to run west of the Missouri river, viz.: Length, 25 feet: height, 12 feet 6 inches from level of top of rail to the top of eave or edge of roof on side of car; width, if height is not more than 12 feet from top of rail, 10 feet; if height is over 12 feet, and not over 12 feet 6 inches from top of rail, maximum width will be 9 feet 6 inches.

Agricultural implements, wagons, and similar freight, when loaded on flat-cars, should not be loaded to exceed 11 feet 6 inches in extreme height above the top of the rail, or 9 feet in extreme width, and should be well secured by iron rods passing over the load, and connecting the upper ends of the stakes in such a manner as to prevent

spreading. The companies reserve the right, when the above are not complied with, to refuse the freight, to transport it entirely at owner's risk of injury from collision of tunnels, water-tanks, snow-sheds, etc., or to remove any excess from the car and charge first-class rates on the same. Cars which exceed these dimensions in any particular will not be received by the lines west of the Missouri river, neither will they pay mileage for the use of cars exceeding 30 feet in length owned by individuals or corporations other than regular transportation companies. All Chicago, Burlington and Quincy cars, including our large furniture-cars, come within the limit of dimensions to permit of their going through to California points without transfer,

Solutions to the Problem in Car-Drilling.

THE following solutions to the problem in car-drilling given in the December JOURNAL have been received. As shown in the cut, the problem was to turn the engine on the "Y" and restore each of the three cars to its original position. The stub-switches S and S′ hold but one car or engine, and each arm or end of the "Y" the full train.



POWASSAN, ONT., January 5th, 1886.

Editor American Railroad Journal:

DEAR SIR.—The following is a solution to the switching problem given in your December issue:

1. Couple engine with car 3.
2. Run it out on main line.
3. Shove it down to car 1, leave the two clear of all switches and on upper arm of "Y."
4. Run engine around to car 2, empty and shove car 2 onto stub-switch S.
5. Run engine back to car 3, again empty.
6. Pull all three cars, clear, on upper arm of "Y."
7. Run engine around empty again behind car 2.
8. Shove all three out onto main line, clear of switches.
9. Now run your engine clean around the "Y," empty, and you will have it standing in same direction as when the solution began. After this the three cars can be put back in same manner as they were taken out, only the order of process being reversed.

Yours very respectfully,
CECIL B. SMITH, B. A. S., C. E.,
Northern and Pacific Junc. Railway.

PALESTINE, ILL., January 1st, 1886.

Editor American Railroad Journal:

DEAR SIR.—I offer the following solution to your problem in December, 1885, number, in drilling cars:

1. Engine puts car 3 between itself and car 1.
2. Engine runs through stub-switch S′ and pushes car 2 onto stub-switch track S, returning the way it came to main line.
3. Engine pulls train onto track stub-switch S side in order, beginning at engine, car 3, car 1, car 2.
4. Engine runs through stub-switch S′ and S, placing itself behind train when it will be turned once, and pushes train on main line.
5. Engine runs back through stub-switch S and S′, when it will be turned the second time, runs up to train on main line and pulls train back onto track on stub-switch side S′.
6. Engine runs through stub-switch S′ and S onto main line when it will be turned the third time and stand at head of train.
7. Engine pushes car 2 onto stub-switch track S′.
8. Engine runs through stub-switch S and pulls car 2 to original position, and returns as it came to head of train.
9. Engine pulls train onto main line, then backs car 1 to original position on stub-switch S side, returns with car 3 to main track, pushes car 3 to original position on stub-switch S′ side, and runs out to its own original position where it will be turned as proposed.

Respectfully yours,
CHAS. SEYMOUR,
Chief Engineer, Bloomfield Railroad.

A still more difficult problem in car-drilling will appear in the February JOURNAL.

IT is rumored that the Baltimore and Ohio Railroad may utilize the Morris Canal for railway purposes in Newark, N. J. The canal is said to have been run at a loss for some years by the Lehigh Valley Railroad Company, its lessees. The Lehigh Valley Company is said to have recently had a proposition to unite with the Baltimore and Ohio Railroad Company, and run trains on the bed of the canal. The canal company has the right by its charter to use the canal bed for the running of trains. Such a combination between the two roads would give the Baltimore and Ohio an outlet at the Jersey City water-front.

A COMPANY has been formed in Pennsylvania, chiefly of Pittsburgh capitalists, for the purpose of building a railway across Kentucky into Tennessee. The line of the proposed road was surveyed from Evansville, Ind., down through Dekoven, Ky., to Jackson, Tenn. It is to be called the Ohio Valley Railroad and extends in a southwesterly direction, opening up a portion of country the richest in mineral and agricultural products of any part of the state. The line will be 200 miles in length and the cost of building will not exceed $2,000,000.

THE value of the coal mined in the United States in a year far exceeds that of all the gold and silver combined. From government reports just issued it appears that the coal yield of 1884 was $143,760,000, that of silver, $48,800,000, and of gold, $30,000,000; the coal product thus exceeding the combined product of silver and gold in value by $64,160,000. In the annual production of coal Great Britain ranks first, followed in regular order by the United States, Germany, France, Belgium and Austria.

THE Pittsburgh, Cincinnatti and St. Louis Railway Company has ceased to operate and control the Cincinnati and Muskingum Valley Railway. The following appointments have been made upon the latter road: John E. Davidson, Pittsburgh, Pa., treasurer; F. G. Darlington, Zanesville, O., secretary and superintendent; John W. Renner, Pittsburgh, Pa., auditor; Geo. W. Davis, Zanesville, O., general freight and ticket agent, and John S. Brasee, Lancaster, O., solicitor.

AS reported by the bureau of statistics the mineral oil exported from the United States during the past year, aggregated 558,086,619 gallons, valued at $49,214,281. The exports in 1884 amounted to $542,217,728 gallons valued at $49,108,511.

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RAILWAY CONSTRUCTION IN 1885.

AS far as reported the total new railway construction in the United States during the past year amounted to 3,113 miles. These figures refer to the main track only, exclusive of second tracks and sidings. It is probable that later reports will increase this mileage somewhat but not to any appreciable extent, and the record shows that the railway construction of 1885 fell below that of any previous year since 1878. Beginning with 1879 the annual construction increased yearly up to 1882, in which year it reached the high figure of 11,596 miles, and then steadily decreased until the low-water mark was touched last year. For that the record of 1885 will prove to be a low-water mark we have little doubt. The present year promises to show a healthy increase in railway construction, though possibly not as marked as the increase of previous years.

Nevertheless, despite the low record of last year it is by no means a bad record. Of the recorded construction little can be classed as speculative. The condition of our railway industries was not such as to warrant construction save where its need was apparent, and there is reason to believe that nearly every mile of new road constructed last year was the result of careful and honest deliberation, and prompted by the needs of traffic. Therefore, it is fair to assume that the new mileage will prove profitable, and that it will not contribute to swell the burdens of railway receivers, which of late has too often been the destiny of newly constructed lines.

If the record of new construction during 1886 amounts to 3,500 miles there will be no reason for complaint. The increase over 1885 will not be great but it will be a tangible proof that railways are making haste slowly in the matter of new construction. Even if the record should fall below that of last year there would be no cause for alarm. As we before stated, there has been an over-production in railway construction of late years, and the railway industry is amenable to the laws of supply and demand almost to the same extent as manufactures. No harm will ensue if the country suffers a little for lack of railway communication for a year or two. The past few years have demonstrated most conclusively that there have been too great railway facilities offered to admit of reasonable profit to the investors, and a period of enforced abstemiousness in the matter of construction will give tone to the railway system.

Still, we believe that the present year will show a slight increase, which increase will prove an index of the actual needs of the country; and not only the actual needs but the immediate needs. Railway investors are not so prone as formerly to discount the future, and this year the railways will grow to the needs of the country, and not, as previously, the country grow to the facilities of the rail-

ways. The speculative era is past and will not return for some years to come, and herein is one cause for thankfulness. Nor is this the only cause. The evils of parelling have been brought to notice, and the wanton extravagance of railway receivers has been held up for condemnation. Altogether we start the new year with indications of a healthy development of railway interests.

REDUCTION OF EXPENSES.

IN a recent article, the Toledo *Blade* holds to the opinion that when a curtailment of expenses becomes necessary on a railway and a reduction of wages is decided upon, this reduction should not be confined to the engineers and train-hands generally, but embrace every official from the president down. The case of the Philadelphia and Reading road is instanced, where the higher officials are receiving liberal salaries while the road is involved in hopeless bankruptcy. In the argument employed there is a good deal of that species of logic known as buncombe. It is stated that the counsel fees all told amount to $120,000, but we fail to see that this item is so very exorbitant when we consider the legal difficulties with which the road is contending. Neither do we consider that the $15,000 yearly allowed to the receiver is an extravagant remuneration, for it certainly compares very favorably with the claims put forth by receivers of other roads—the West Shore for instance. In fact the salary list of the Reading road, which the *Blade* seizes as a basis for its argument, appears to be decidedly moderate. Despite its bankruptcy the road is admirably managed, is fully alive to the requirements of the times and keeps abreast with railway progress in general. It is evident that its officials are in every way competent to fullfill the trusts imposed upon them, and we do not think their salaries are unduly liberal.

The railway official is, or should be, a man of peculiar aptitude. Railway management is not a trade nor even a profession. It partakes more of the character of an art. To a certain extent a railway official must by nature be fitted for his place. Whether he be a president or a superintendent he must be, above all, a railway man, and the supply of true railway men is limited. Naturally they command their own price and are generally paid no more than their services are worth. True, when the question of receivership is discussed, much can be said on the other side. The modern railway receiver is rarely a railway man and his services are generally inordinately remunerated, but apart from this anomalous railway official—if indeed he can be called such—the average officer of a railway is a man whose services are highly valuable, and the more so because of the comparatively small number of men who are fitted for such trusts.

In the matter of the reduction of employés' wages it can safely be said that the occasion is rare when such reduction is made save as a last resource. As a rule, the wages of employés are regulated by well-known standards and these wages are generally fair. The railway employé is of necessity a man of intelligence and he is subjected to a thorough training before he becomes a full-fledged employé. But apart from this intelligence and training there is little call for special aptitude. An engineer must be a man of cool temperament, sober, reliable, and of considerable nerve; but these attributes are not especially rare and it follows that the supply of competent locomotive engineers is generally fully up to the demand. Consequently the wage question will settle itself. The engineer will accept whatever wages he can get, and the amount thereof is determined by the willingness or the unwillingness of other equally competent engineers to work for less. So it is with all railway employés as distinguished from railway officials. The one class are trained up to their fitness—the other to a great degree possess an innate fitness which no amount of training could implant, although, of course, training greatly enhances the value of their services.

It is folly to class the railway official with the railway employé. As well might the author be classed with the type-setter, or the artist with the picture-frame maker. The one is a man of special aptitude, special fitness, and special ability; the other a man of general intelligence and general capacity, his training alone being special. The one, to a greater or less extent, will command his own price, and the wages of the other will be regulated by the laws of supply and demand.

It is true that instances are not wanting where the employé has developed into the official, but such promotion arises not through training but through a special fitness which the employé possesses. It is also true that the railway employé perhaps stands as the representative of the highest type of skilled labor; but skill is not talent, and the railway official must have the latter.

On the whole such discussions afford little profit. The matter may be relied upon to shape itself, and a railway may in general be trusted to reduce its expenses in a manner which will least injure its efficiency. But such reduction cannot be effected on communistic principles.

EDITORIAL NOTES.

THE recent conference between the Brotherhood of Locomotive Engineers and the management of the elevated roads in this city, is a further instance of what may be accomplished if both parties to a disagreement endeavor to meet each other in a spirit of fairness. An honest intention to do what is right and accord to each side the

justice due, will, nine times out of ten, avert strikes; and the amicable settlement of the dispute between the elevated roads and their engineers is simply due to the fact that neither side attempted to secure an unfair advantage. The various trades-unions would do well to follow the general policy of the brotherhood, where no attempt is made to boycott employers.

* * *

CONGRESS is in session and the country awaits with interest the outcome of the deliberations of their representatives under the first Democratic administration for twenty-five years. So far, President CLEVELAND has shown himself to be alive to the interests of the country and pretty generally seems to be on the side of common-sense. Whether or not congress will conduct itself with wisdom and moderation remains to be seen, and congress is a very uncertain body. But certain it is that the members of the forty-ninth congress have it in their power to make or mar the first portion of President CLEVELAND'S Administration.

* * *

AND speaking of congress it is to be hoped that it will early in the session take steps toward the passage of a Bankruptcy Bill. Too long have we been without one, and it is high time that the advocates of various measures to accomplish this end should come together and decide upon a bill that will answer the requirements of all sections of the country.

* * *

THE recent "cut" in rates to the west by the Baltimore and Ohio has disturbed the pool lines more than they are willing to admit. The staid old road is rapidly coming to the front as one of the trunk lines, and sooner or later will be in a position to demand recognition as such. In the meantime the Staten Island bridge question, on which the Baltimore and Ohio has pinned its hopes for admission to New York, has been brought up both in congress and in the New Jersey legislature, and hot fights in both bodies may be expected.

* * *

STANDARD time has now been with us for three years and it has proved an incalculable blessing not only to the railways but to the whole country. Therefore we chronicle with pleasure the presentation, by a committee from the Southern Time Convention, of an appropriate token of regard to Mr. W. F. Allen, of the National Railway Publication Office, in appreciation of his energetic services in securing the general adoption of standard time.

DR. ROBERT GRIMSHAW, formerly editor-in-chief of the *American Journal of Railway Appliances*, is now conducting *Mechanics*, with which publication he has incorporated his new journalistic venture, *Practical Progress*. The first number of *Mechanics* under its new management is an admirable one, and the high reputation of its editor is a sufficient guarantee of its value and interest. *Mechanics* is published monthly at 169 Broadway, New York, at $1.00 per year.

THE *Century's* war series is continued in the January number in the form of two papers, "The Second Battle of Bull Run," by Gen. Pope, and a continuation of the "Recollections of a Private," by Warren Lee Goss. An illustrated article on "Some European Republicans," by W. J. Linton, and the conclusion of ex-Minister Benjamin's illustrated description of "The City of Teheran," are among the contents of this excellent number.

Outing has removed its office of publication from Boston to 140 Nassau street, New York. This change cannot fail to prove of benefit to the publication, and in its new home it will doubtless continue its career of unbroken prosperity. The January number is excellent, as usual.

MR. F. B. BROCK, of Washington, D. C., attorney and solicitor of patents, has issued a pamphlet giving in full the official rules of practice of the United States Patent Office. The pamphlet is of great value to inventors intending to secure patents.

A COPY of the third annual report of the Board of Railroad Commissioners of the State of New York is received, but too late for extended notice in this issue of the JOURNAL.

A PHOTOGRAPHIC plate of "Representative Parisian Journalists," with their autographs and respective journals, is the latest novelty issued by the enterprising firm of Root & Tinker, of this city.

Power and Transmission, a journal devoted to manufactures, mills, science, art and invention, is a new and interesting little monthly published at Mishawaka, Ind., at fifty cents per year.

The Mining Review, published in Chicago, is another candidate for favor in mining circles. It has numerous departments and shows signs of careful editing.

Paper and Press is a handsomely printed and well edited publication devoted to the interests of the paper and printing trades. It is published in Philadelphia at $1 per year.

THROUGH the courtesy of the Iowa Railroad Commissioners advance sheets of their eighth annual report have been received.

GERHARDT'S safety car-truck, an advertisement of which appears on another page, seems to meet entirely the requirements of a safety appliance which in event of the wheels leaving the track, or of an axle breaking, will maintain the trucks and cars in their proper position and avert loss of life and property. It appears to answer a long-felt want, as was mentioned editorially in the December JOURNAL, in lessening the chances of disaster in railway accidents. The device was described at length in the October JOURNAL.

Street-Railways.

American Street-Railway Association.

President.—Julius S. Walsh, President Citizens' Railway Company, St. Louis, Mo.

First Vice-President.—William White, President Dry Dock, East Broadway and Battery Railroad Company, New York City.

Second Vice-President.—C. B. Holmes, President Chicago City Railway Company, Chicago, Ill.

Third Vice-President.—Samuel Little, Treasurer Highland Street-Railway Company, Boston, Mass.

Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.

Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

The Fifth Annual Convention of the Association will meet in Cincinnati, O., on Wednesday, October 20th, 1886.

THE QUESTION OF HEATING.

WITH all their enterprise American street-railways move with remarkable slowness in adopting means of heating their cars. We do not believe that the question of cost enters into their seeming opposition to warm cars, for the expense would be but trifling. Neither do we believe that they are deterred from adopting some heating system for the reason that its introduction would seriously lessen the accommodation of the vehicles, for it has been successfully demonstrated that at the outside the heating apparatus need occupy but the space of one passenger. More likely is it that the indifference of street-railway officials to this important subject is owing to the fact that the days of excessive cold, when street-cars become uncomfortably frosty, are rare, and occur at considerable intervals; and before the grumbling of passengers becomes wide-spread, the weather moderates and the cars again are comfortable despite the absence of stoves or other means of heating.

Nevertheless, a winter rarely passes that we are not visited by cold snaps that render our street-cars anything but comfortable, and unquestionably a long ride taken in one of them subject to the constant draughts induced by the frequent opening of the doors for the entrance and exit of passengers cannot be a healthy undertaking. A severe attack of cold weather is consequently followed by a diminution of travel in those lines of street-railway where the cars are not warmed, and we have no hesitation in expressing the belief that the resultant financial loss to such companies amounts to more than the cost of maintenance of a satisfactory heating system.

Of heating systems there is a variety to choose from. If stoves for any reason are deemed unsatisfactory and inconvenient, there are systems that employ methods of steam and hot-air heating by means of storage. Still again, we observe that a system of chemical heating by the use of soda has lately been introduced in England with indications of success when it shall have been perfected. Nor need there be any fear that any heating system will prove a nuisance by reason of its inducing an unhealthy and superabundant heat. The frequent opening of the car-doors and the ready means which the ventilators afford to reduce heat and purify the air obviate any objections on that score. And at the same time it must be remembered that it is not essential that cars shall be heated during the entire winter. Such heating need only be resorted to in decidedly cold weather, which in the latitude of New York City occurs but comparatively rarely.

Altogether there appears to be no sound reason why our street-cars should not be properly heated—or at least the chill taken off them—in seasons of extreme cold, and we believe a little agitation on the subject will bring such a desired innovation into general practice.

STREET-RAILWAY agitation in New York City still continues and the latest project is to operate a cable road on Fifth avenue. Apparently this one remaining thoroughfare which so far has escaped the gridironing of street-railway operators exerts a strange fascination. Whether or not the project will be carried through remains to be seen. Certain it is that the board of aldermen move a little more cautiously this year than last. Or, perhaps, they hold their services at a little higher price. Practically the effect will be the same.

PUBLICITY OF STREET-RAILWAY RULES.

BY M. C. ELLIS.

[Written for the AMERICAN RAILROAD JOURNAL.]

THE "Rules Governing Conductors and Drivers," submitted by the special committee to the American Street-Railway Association at their recent convention, and published in full in the December JOURNAL, is an exhaustive treatment of the subject from a *general* point of view, but is not specific. We are told what is the best general policy for street-railway managers to pursue in dealing with their employés, and the proper conduct of the latter is outlined both with reference to their dealings with the company and with the traveling public. I, for one, and I presume I speak the wishes of a number of the JOURNAL'S readers, would have been glad if the intelligent gentlemen who had formed the committee had submitted what they deemed the best rules for observance in the form in which they should be submitted to the employés and known to the public. The difficulty hitherto has been that the public are not informed as to the rules of a street-railway, and are therefore ignorant as to whether or not a conductor or a driver is following out his instructions when on duty.

And again, rules are frequently established which are intended to be broken, and it is hard for the ordinary traveler upon our street-cars to know before making a complaint to a road of the conduct of its employé if the said employé has been acting contrary to instructions. It is most common—almost universal in fact—for a rule

to be prominently posted stating that no persons are allowed to ride on the car-platforms, and a half-a-dozen or more persons will be standing thereon directly in sight of this prohibitory notice. Similarly, nearly every street-car bears a prominently posted notice that no smoking will be allowed on the car, while the front platform, and oftentimes the rear platform, will be crowded with male passengers indulging in the habit. Of course, the conductors and drivers have been told what to do and obviously they have been informed that these rules are not to be rigidly observed; but how are the public to know that? and how is a passenger who is suffering in a crowded car from the fumes of tobacco to know that he has no right, under the company's rules, to request the conductor to prohibit the smoking?

These are but instances of the very lax rules that street-railways have adopted as regards the public conduct of conductors and drivers. It is highly likely that there are rules adopted by street-railway companies, unknown to the public, which are strict and rigid, and with which all their employés are expected to comply; but the public's confidence has not been sought and therefore there is little or no complaint made when these unknown rules are publicly broken.

If the street-railways would issue exact rules and regulations for employés in such concise form that they could be posted in each car directly before the eyes of the passengers, the traveling public would know where they stand and would know the precise rights and comforts to which they were entitled. As a result the employés would be enforced to obey these rules with greater exactitude than at present. The knowledge that the passengers were quite as well aware as they of what constituted a conductor's or a driver's proper duties, would greatly stimulate the latter to a proper observance of the rules. They would, as it were, find every passenger a species of employer's agent.

Therefore, while the rules and regulations submitted to the American Street-Railway Association are excellent and deserving of general adoption, they do not cover the ground entirely. What is wanted are a few brief, sensible regulations concerning the public conduct of conductors and drivers that may be comprehended and understood by the traveling public. There is no good reason that I can see why the public should not know the exact amount of discretionary power with which a conductor or driver is intrusted. When this is known, it will also be known just what is the duty of these functionaries in the emergencies which daily occur in our street-railway travel.

TRACK REPAIRS.

[Report of the Special Committee read at the recent Convention of the American Street-Railway Association.]

THE Committee on track repairs submits the following:

Intelligent track repairing means not alone repairing; it means improvement. Realizing this, your committee has made a careful study of the more important factors of track-construction. In the name of the association it has called to its aid the experience, in particular, of those who had worn out their tracks. We have done this partly by circular, but principally (knowing the street-railway men's aversion to a letter) by personal application, to which end we made special arrangements.

We append a copy of the questions to which we solicited answers. Suffice it to say that they deal principally with the following subjects, which subjects we have used in the classification of the details of this report:

First, the rail; second, the stringer; third, the joint; fourth, the question of spread of track; fifth, the cross-tie.

We have gathered replies to our questions on these subjects from about one hundred and fifty companies, and have based our calculation on these replies.

1. THE RAIL.

We have endeavored to learn more from those who *have* worn than from those who *are* wearing out their tracks. We must, therefore, touch but slightly on the center-bearing type of rail unless later on, by comparison; because first, it is the newer rail of the two, and second, it has worn better and we have not so much to learn from it as to track defects.

Taking a general average we find that thirty-four companies have worn out a side-bearing rail averaging slightly less than 40 pounds per yard in 15.35 years. The rails were all of iron. Comparing the average wear of a light with a heavy rail we find as follows: Twenty companies averaging a 44½-pound rail wear it out in 16.25 years, whereas fourteen companies averaging a 30-pound rail wear it out in 14.07 years.

It is claimed, generally, by those urging the light rail that it will in their case give an average wear. That is to say the 30-pound rail used where the traffic is light will wear as long as the 44-pound rail where the traffic is medium to heavy. The statistics do not bear this out, and indicate that the use of the light rail has been pushed beyond economical limits.

We can, from the replies, gather two other points in connection with the rail: First, that the center-bearing type has proved more durable and far more satisfactory in the matter of track repairs, and second, that the use of steel is becoming universal. It is not necessary to wear a rail out to judge of its comparative life. The general experience with steel indicates that it is beyond doubt a very far more durable and economical material,

2. THE STRINGER.

We have looked into this in three ways. First, the average life of the stringer, regardless of the kind of timber or the nature of the paving; second, the average life of the stringer according to the kind of timber regardless of the paving; third, the average life of the stringer according to the kind of paving regardless of the timber.

1. The general average of life of stringers taken without regard to qualifications we find to be 8.9 years.

2. Classifying the stringers according to timber only, we find as follows:

A. Oak stringers average 8 years; B. Yellow pine stringers average 8.5 years; C. Spruce and hemlock stringers average 9.2 years.

It is regretted that the number of reports on oak stringers was not greater. We do not think the average given is thoroughly representative. It is believed that had we succeeded in getting fuller replies from those

using oak it would have been found more durable. In this surmise we are somewhat borne out by the investigation of T. B. Hough, given below:

INVESTIGATION INTO DURABILITY OF CROSS-TIES ON STEAM RAILROADS. BY T. B. HOUGH, FOR THE DEPARTMENT OF AGRICULTURE.

White Oak averaged	7.3	Years.
Post " "	7	"
Burr " "	7.4	"
Rock " "	7	"
Red " "	5	"
Chestnut Oak "	7.1	"
Black " "	4.5	"
Long leaf Southern Pine averaged	6½	"
Cedar averaged	11.8	"

(Red cedar outlived the white in the proportion of 11 to 7.)

Cypress averaged	8.7	Years.
White Ash "	4.3	"
Black " "	3.8	"
Cherry "	6 to 10	"

All woods more lasting when hewn than when sawn.

It will be seen that the white oak outlasted yellow pine as 7.3 to 6.5, both subject to similar conditions of wear.

3. Classifying the stringers according to kind of pavement only, we find:

A. In gravel and unpaved streets stringers averaged 8.75 years; B. In McAdam streets stringers averaged 8 years; C. In cobble-paved streets stringers averaged 9.6 years; D. In stone-block pavement stringers averaged 9.9 years.

While dealing in the main with averages there are many points of value indicated in the general nature of the replies that must not be ignored. Noticeable among which is the great variation that exists in the life of stringers with the different companies. It is a variation that is pointed no matter which way an analysis is made. For instance, we find that in unpaved or gravel streets the variation in life is from seven to ten years, in cobble pavements from five to twelve years, in block stone pavements from eight to twelve years, while in McAdam it seems more regular. We look for the cause of this in the varying conditions of the pavement, and we are inclined to assert that the *condition in which the pavement is kept* is to the street-railway man a more important factor than either the kind of timber or the class of pavement. We believe this point merits special and careful investigation.

It must be remembered that the above deductions are based upon worn-out tracks. From the replies will be gathered the fact that nine companies report pine stringers in the track for an average between them of fifteen years and still good.

In this connection we made a study of the rainfall from the United States Signal Service Reports. We could get no daylight. Not because it rained so hard, but because it followed no set rule. We found the question was less the amount of rainfall than the manner of the same. The difficulties of a proper comparison of the irregularities at the different points would have been too exhaustive for such a report as this.

In considering the question of stringers we have been fortunate in getting copies of some recent tests of the holding power of spikes on the yellow pine and white oak. We append the same:

TESTS OF HOLDING POWER OF RAILROAD SPIKES. BY CAMBRIA IRON COMPANY, JOHNSTOWN, PA.

MEASUREMENT RESISTANCE TO STARTING.

The same six spikes were used throughout, 5½ inches long, $\frac{9}{16}$ square. They were driven in the same distance each time viz.: 4¾ inches.

A.—In well-seasoned Yellow Pine (heart).

No. of Spike.	1st Time Driven.	2d Time Driven.
1	2,865 lbs.	2,275 lbs.
2	2,880 "	2,085 "
3	3,225 "	1,400 "
4	4,000 "	3,250 "
5	4,000 "	
Mean	3,394 "	2,252 "

B.—In well-seasoned White Oak (heart).

No. of Spike.	1st Time Driven.	2d Time Driven.
1	4,500 lbs.	4,000 lbs.
2	5,215 "	3,510 "
3	5,100 "	3,100 "
Mean	4,938 "	3,837 "

It will be seen that the resistance to starting was about one-half greater in the white oak, both in the first and second drivings. The superior holding power of the oak is also substantiated by such investigators as Funk, Von Weber and Von Raven.

For the above reasons we believe that in repairing stringers the white oak is the best timber to use. First, because of its durability, and second and most important, because of its greater holding power on the spikes; certainly a matter of prime importance with the stringer rail.

We are aware that in recommending the white oak we shall run counter to the accepted belief of many, but we are willing do so, feeling that if our course provokes a discussion and ventilation of the matter it will do more good than our error, if it *is* one, will do harm. We further recommend that special attention be paid to the condition of the pavement adjoining the stringer. When stone-block pavement is not in use the custom of paving immediately adjoining the stringer merits endorsement wherever the nature of the rest of the paving warrants it.

3. THE JOINTS.

As is well-known this is one of the items of largest and most constant expense.

The defective joint of the stringer rail is due to the flexible nature of the form and the consequent motion that finds its vent at the ends. There is but one way of meeting thoroughly this trouble which is to reduce the flexibility of the rail, To a certain point this has been done in the use, prevalent particularly in the east, of a very heavy rail, and so far as it has gone the improvement of the joint has been marked. The effort in this direction has gone as far, perhaps, as economical considerations will justify, and it is well to note that even in this case a defective joint is the result. We believe this exists with the very heaviest rails to an extent not generally realized. Careful measurements will show that on most of the lines in New York and Brooklyn the rails at the joints are wearing far more rapidly than elsewhere. The evil is not so much due to the yielding nature of the stringer at this point as is generally supposed. When the yield of the stringer is remedied by close attention and constant lining up of the joint-plates the wear immediately finds a new vent between the rail and the joint-plate. We have found in our investigations an instance wherein the end of the rail and the joint-plate had so worn that each had left its impress upon the other, the rail actually wearing into the plate. We take the broad stand that defective joints must be accepted as a necessary defect. It is the "social evil" of the street-railway system. But we further find that while it can not be entirely overcome it can be kept within bounds. There are two methods of im-

provement. One is to overcome as far as possible the motion at the joint ends of the rail by anchoring down to the stringers; the other is to bridge the ends with a false plate. Both have been intelligently experimented upon, and both have given promising results. We commend either plan as a large improvement upon the usual flat joint-plate dependent only upon the spikes.

4. SPREAD OF TRACK.

Replies on this point indicate two main causes. First, yielding of the stringers. In this case the rails of course go with them. Second, tendency of the rails to creep on the stringers. Twenty-one companies attribute spread of track to movement of the stringers. Nine companies to the movement of rails on the stringers. It will be noted that the first cause is more prevalent in towns of medium sizes, the second in the larger towns. We think this result is logical.

The stringers are apt to yield if not well supported by the surrounding pavement. In towns and cities of moderate size defectively kept up paving is a normal condition of affairs. In the larger cities, as a general thing, the paving is kept in better condition and the stringers less apt to yield. But, on the other hand, the street traffic is generally heavier, and where side-bearing rails are used the rails must pay the penalty. On the side-bearing rail are two lines of travel, car travel on the head and street-vehicle travel on the tram. Both tend to and do elongate the rail. If nearly evenly balanced the rail remains straight. If, as is the case ninety times out of a hundred, the travel of street-vehicles is in large excess, the tram will elongate at the expense of the head, resulting in a curve in the rail which tends to throw the joints out over the stringer. In such a case the track has the appearance of a series of bows or arches laid on their sides. In Philadelphia and New York the number of wagons and street-vehicles passing on the track compared with the number of cars by a test count is five to one.

It seems to be the general opinion that the use of good, substantial braces is preferable to the use of tie-rods. This seems intelligent in view of the fact that with the brace each stringer takes care of itself, while with the tie-rod it calls on its neighbor for help.

Neither tie-rod nor brace will overcome creeping of the rail. We believe there is but one remedy for this—the use of the center-bearing rail.

5. THE CROSS-TIE.

We believe the statistics gathered on this point can be regarded without reference to the condition of the pavement (unless when a very shallow stringer is employed) as the cross-ties are generally below its influence.

We note from the replies: First, average life of pine ties, 17 years; second, average life of oak ties, 15 years; third, average life of spruce and hemlock ties, 19 years.

The averages are based on ties that have worn out. There are a large number of companies still using ties reported good for many years after an average of 17 years' use.

We are at a loss to account for the great durability of the spruce and hemlock, which for want of larger averages we have classed together. It seems to apply to both stringers and ties. We hesitate to endorse the averages given in this case as thoroughly reliable, but as they are based on the replies received we place them on record.

In cross-tie lumber we think the prime requisite is the nature and quality of the timber. In cross-ties, to a greater extent than in the case of stringers, the disturbing element of the paving being absent, they stand more on their own merits.

We submit further that in view of the fact indicated by the replies, viz.: that the timber ordinarily used for ties will outlive two sets of stringers, and but few of them reach the life of three sets, one of two policies should be adopted.

First, to so carefully select the nature and quality of the tie timber as compared with that of the stringer as to secure a longer comparative life for the former, so that one set of ties shall safely reach the life of three sets of stringers. As the saving is to a greater extent a question of time and labor than the first cost of the ties, this point merits consideration.

Second, to accept the life of two sets of stringers as the duration of the ties and select such timber as will give the best track results in the interval. In this case the question is not one of quality of timber, but of the holding power of the spikes. Locality should determine which policy should rule. With well kept up pavements the first would give greater economy. With poorly kept up pavements the second.

It should be borne in mind that with poor pavements the tie becomes something more than a floating medium for the track. By means of the spikes and braces it has as much to do with holding the track to gauge as with holding it to surface. In the latter case, unquestionably white oak is the best timber. Indeed, it seems to us largely an open question whether the holding power of the timber on the spikes is not as important a factor in its value for street-railway construction as the difference in its average life. For instance, we have indicated a difference in the life of pine and oak stringers, taking our averages of 8½ years pine and 8 years oak, or about 6 per cent. in favor of the pine.

In the cross-ties we find 19 years pine against 15 years oak, a difference of say 13 per cent. in favor of pine. Whereas we find the spikes will hold at least 50 per cent. better in the oak. The question occurs which is the most valuable factor, an increase of 6 per cent. in the life of the timber or 50 per cent. in the holding power of the spikes.

The information given on the subject of cross-ties seems to bring to light another point of interest. It is noticeable that a special average taken for the light tram-rail used in conjunction with the shallow stringer gives an abnormally low life for the cross-ties. The average given is about ten years. It indicates that the shallow stringer brings the ties up into the influence of defective pavement. It has been shown that the light rail does not give its average of life; it is now indicated that the shallow stringer brings equally great evils into play. The deduction seems to be that if a projected new line, or the repairs of a light track, do not justify the construction of a substantially heavy road they will not justify the existence of a road at all. In other words, the light tram road is an absolutely more expensive track when measured by its life, even when subject to the normal traffic of small points.

APPENDIX.

THE RAIL-CONSTRUCTION.

The prevalence of the T-rail in almost all the southern cities, and its use in the suburbs of the larger points has made it a factor of no little interest to many street-railway men. As a rule, a rail that weighs from eighteen to twenty pounds is most used. From the replies we gathered that its average life does not exceed seven years. As might have been expected, when it is remembered that the heavier rails carry a larger percentage of metal in the head or wearing part, the life of a T-rail varies rapidly with the weight. As an extreme to the short life of the light rail may be taken the averages as given for the heavier T-rail used in the suburbs of such points as Cincinnatti and Baltimore, and in the cities of Charleston, Savannah and Augusta.

The averages show 18 to 20 pound T-rail, 7 years; 20 to 25 pound T-rail, 9 years; 30 pounds and upwards, but slightly worn after an average of 7 years and in some cases good after over 16 years' use.

The cost of the rail is only part of that of the road, and is a smaller part than is generally considered by those who adopt it. We submit that the replacement of the light rail by one weighing not less than 30 pounds is one that will be the most economical.

The whole tenor of the statistics gathered seem to your committee to impress clearly one lesson, viz.: that in all street-railway work the best is the cheapest. The general use of steel as a material offers a striking contrast in its durability to the figures we have reached as to the average life of iron rails. It is not necessary to wear a rail out to judge of its economy—indeed the very fact that the steel has not worn out in many instances conveys the whole proof.

We go so far as to isolate street-railway repair and construction from the principles governing almost all ordinary construction, in asserting that the true principle of economy for street-railway work is to think of merit first and first cost afterwards. The substantial—cheaply as possible, but the substantial—cost what it may.

We call attention in closing that the averages deducted are not absolute *finally*—they *are* absolute *comparatively*, as will be clearly understood from the explanations given.

Compressed-Air Motors for Street-Railways.

ABOUT two years since, says the London (Eng.) *Times*, we described a system of air-driven tram-cars which was then about to be adopted on the Caledonian road line of the London Street-Tramway Company's system. This was the Mekarski system, and the car which was then experimented with was put on for regular traffic, and was worked on that road for about four months, taking its turn with the pair horse-cars. It was intended then to displace the whole of the horse-worked cars on this line by ten air-driven cars, but various delays occurred which prevented effect being given to the intention until the present time. Now, however, arrangements have been completed, and the first of the series of cars will very shortly be placed on the line for regular working, to be followed in due course by the other nine which are being built. Since our previous notice, however, several improvements have been introduced into the details of the air-engines, which are now made upon the compound principle. The high-pressure cylinder is 5¼ inches and the low-pressure 8 inches in diameter, with an 8-inch stroke, and through these the compressed air from the reservoirs is successively used. Means are provided by which the high-pressure air can be used in the low-pressure cylinder if necessary. The engine-house containing the air-compressing machinery is situated at the Holloway road end of the tramway line, where there are boilers, engines and pumps, by means of which atmospheric air is compressed, at a pressure of 450 pounds per square inch, into reservoirs placed in the engine-house. From these reservoirs the air is conveyed to the tram-car through charging-pipes with proper couplings, which are connected up for charging, and disconnected when the reservoirs on the car—which are placed underneath the platform—are charged to the necessary pressure. The principal feature of the system, however, is that the air in passing from the reservoirs on the tram-car to the cylinders in the engine is conducted through boiling water and steam at a pressure of 60 lbs. to the square inch, which is contained in what is known as a hot-pot. This hot-pot is charged at the compressing station while the car reservoirs are being filled with compressed air. By this means the heat which the air takes up during its passage through the hot water not only causes the air to expand but prevents the formation of snow in the cylinders and at the exhaust. The working pressure in the high-pressure cylinder ranges from 150 lbs. down to 50 lbs. per square inch, and can be varied at will. There are efficient brake arrangements, and all the other requirements of the Board of Trade have been amply met. The first of the series of cars for the Caledonian Road line was inspected recently at the Inventions Exhibition by a number of gentlemen interested in tramway locomotion. They were received by Capt. Clipperton on behalf of the company, and the construction of the engine and its working were explained by Mr. Harris, for Sir Frederick Bramwell, who is the engineer of the Mekarski Company, but who was unavoidably absent. The car was run to and fro on a short line in the south promenade of the exhibition, its working powers being satisfactorily demonstrated over such severe curves as could not occur in practice. We may add that the tram-cars upon the Mekarski system have been successfully working on the tramway lines at Nantes, in France, for the last six years.

New York Street-Railway Statistics.

COUNTING the annexed districts, New York City is about three-and-one-half miles wide and thirteen miles long, which necessitates many north and south means of transit. Those from Canal to Fifty-ninth street are inadequate. The success of the new Broadway line is an indication of the needs of the city. The capital stock of this corporation is $1,000,000, on a line only one and three-quarters of a mile long, and it has an indebtedness of $3,500,000. The stock is selling in the neighborhood of $1,000 per share.

The market price of the shares of a railway is a good indication of the intrinsic value of the property, especially in case of such stocks as surface railways. The Broadway

and Seventh avenue line, which is capitalized at $2,100,000 and has a bonded debt of $2,289,953, bearing 5 per cent. interest, pays 8 per cent. per year dividends and sells at $275 to 280. The line is eight miles long, and the equipment consists of 1,350 horses and 121 cars. In 1884 they carried 17,771,110 passengers, the gross earnings being $892,865 and the net earnings $253,921. The Central Park, North and East river road, with a capital of $1,800,000 and a debt of $1,225,567, owns thirteen miles of track, 1,223 horses, 161 cars, carried 15,849,982 passengers in 1884, netted $235,565 and paid 8 per cent. This company was chartered in 1860 and has been through the successive stage of scrip dividends. The Dry Dock, East Broadway and Battery road, with 11⅝ miles of track, 1,123 horses and 187 cars, carried 18,141,414 passengers in 1884, and netted $32,387, paying 13 per cent. dividends. The Eighth avenue line, capitalized at $1,000,000 and bonded as same, paid 14 per cent. on ten miles of road. The Forty-second and Grand street ferry line, 5.13 miles long, with a capital of $748,000 and a bonded debt paying 7 per cent., paid dividends of 18 per cent., the last quarterly dividend being 4 per cent. The Second avenue line, eight miles long, capitalized at $1,861,833, and bonded at $1,325,000, earned $327,144 net, and paid 10 per cent. dividends. The Sixth avenue line capitalized at $750,000, bonded at $1,250,000, four miles long, earned above operating expenses and fixed charges sufficient to pay dividends of $675,000, amounting to 90 per cent., and still carry to their surplus earnings the sum of $79,718. The Third avenue line is capitalized at $2,000,000, has a bonded indebtedness of $2,570,000, is 10½ miles long and paid 16 per cent. dividends in 1884.

Street-Cars in Paris.

THE street-car system of Paris is as nearly perfect as human ingenuity can make it. The cars run on T-irons about eight inches high, placed on concrete. This keeps them always even. Hence, riding on a Paris car is so noiseless that one can talk in a whisper, and you can read your paper without having your heart bounced into your hat every now and then. From the platform a steep stairway leads to the top, where sixteen people can find seats, an iron railing serving as protection. As soon as a passenger steps on the platform the fact is registered by the conductor. When every seat is full a sign, "complete," is turned down, and no more will be admitted. Hence, no one ever rides in a Paris car without a seat. It makes no difference whether you have been late, through following dear old Lamb's advice to digest your dreams, you have to wait. You may swear that your home is on fire or your bull-pup has the mumps. You will just have to wait. Of course, in such a case one of the 15,000 cabs in the city will soon accommodate you for 25 cents. The fare is six cents inside and three cents on top of the cars. Every half mile there is a station where the car stops. When the weather is bad the cars become quickly crowded, and you may see three or four of them go by with the tantalizing sign, "complete," hanging out. Then you go to the station and take a ticket with your number on it. When the car comes the conductors calls out, one, two, three, according to the number of places he has unoccupied. The remainder of the passengers have to wait for the next.

STREET-RAILWAY NOTES.

THE New York, Fordham and Bronx River Railway Company has been incorporated with a capital of $1,000,000, to build an elevated road on 138th street, Lincoln avenue and Third avenue, or Fordham avenue. It will cross the Harlem river from Second to Lincoln avenue, and from the grounds of St. John's College to the Bronx river it will be a surface road. Its length will be three miles.

AN electric railway on the Van De Poele system has been opened at South Bend, Ind. A single overhead wire transmits the current by means of a traveler; the tracks constitute the return circuit, brass strips being placed under the rail-strips to ensure a good circuit. There are two large Van De Poele dynamos run by water-power.

THE Consolidated Rapid Transit and Elevated Railroad Company, of Chicago, has been incorporated with a capital stock of $12,000,000. The purpose is stated to be to construct an elevated railway from the city of Chicago to Riverdale, South Chicago, Englewood, Washington Heights, Proviso and Norwood Park.

THE St. Paul (Minn.) Street-Railway Company will build an extension next year; 1,500 tons of steel rails have been ordered, which is said to be the largest order ever given for steel rails for a street-railway. The total expenditure for the extension will be $300,000.

THE Chicago Passenger Railway Company has approved a line on Adams and Harrison streets. Experiments will be made with the Hongman fireless motor, which is operated by soda, and has been successfully adopted in Europe.

THE Chicago and Western Dummy Railway has been sold at auction to F. W. Betz for $46,000. The purchaser represents parties unknown. The road extends from the western limits of Chicago to the Desplaines river.

THE Manufacturers' and Mechanics' Exhibition Building at Boston, which cost $400,000, was sold to the Metropolitan Horse-Railway Company for $300,000.

THE Capital City Street-Railway Company, of Montgomery, Ala., is making arrangements to substitute electric motors for mules.

THE Elkhardt Street-Railroad Company has been incorporated at Indianapolis, headed by William P. George. Capital, $50,000.

THE Menasha and Neenah Street-Railway Company, of Madison, Wis., has been incorporated with a capital stock of $25,000.

THE Enterprise Railroad Company, of Charleston, S. C., has decided to extend its tracks through a number of streets.

THE Central Electric Street-Railway projected for Washington, D. C., will be similar to the Baltimore line.

THE scheme of building a street-railway in Geneva, N. Y., has been under discussion lately.

THE new street-railway between St. Joseph, Mich., and Burton Harbor, is now in operation.

BIRMINGHAM, England, has decided to adopt the cable system for its street-railways.

IT is proposed to build a street-railway in Meriden, Conn.

New Inventions.

Skinner's Link-and-Pin Coupler and Uncoupler.

JOHN SKINNER, of Flint, Mich., is the inventor of an improved form of car-coupling, which is herewith illustrated and described. It is the purpose of the invention to provide a simple, durable and efficient device which may be used as an automatic coupling, and by which the link may be held at any desired angle to enable it to be used upon cars having their draw-heads at different heights, the coupling-pin being upheld by a counterbalance which has pivotal connection with the draw-head.

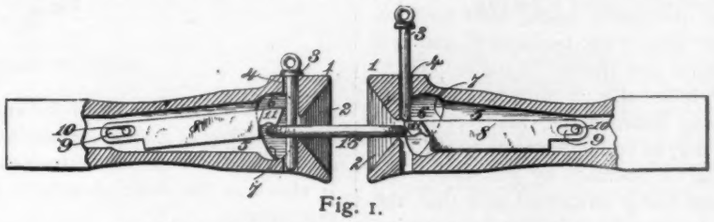


Fig. 1.

SKINNER'S LINK-AND-PIN COUPLER AND UNCOUPLER.

In the accompanying cuts, Fig. 1 is a central longitudinal section taken vertically through two contiguous draw-heads provided with the invention; Fig. 2 a horizontal section taken longitudinally and substantially in a central plane, and Fig. 3 a detail perspective showing the construction of the pin-supporting device. Figs. 4 and 5 refer to a modification which will hereafter be described.

1 indicates the draw-head, which is provided with the flared opening 2, behind the coupling-pin 3, in a vertical opening 4. Running longitudinally through or nearly through the draw-head is formed an opening or chamber 5, having its forward end opening into an enlarged chamber or space 6, which is located just behind the pin 3. Upon each side of this chamber the walls thereof, which

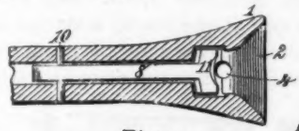


Fig. 2.

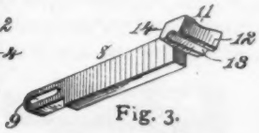


Fig. 3.

SKINNER'S LINK-AND-PIN COUPLER AND UNCOUPLER.

are adjacent to the channel 5, are formed with curved and forwardly-inclined surfaces 7, for a purpose presently to be explained.

Within the channel or opening 5, is placed a bar 8, having at its rear a slot 9, through which passes a pivot-pin 10, set in the vertical walls of the opening 5. At its forward end the bar is provided with a cross-head 11, which lies in the chamber 6. This cross-head is beveled off in front at 12, and upon the lower surface is formed a transverse groove 13. The rear edges 14, lying upon each side of the bar, engage with the curved walls 7, of the chamber 6, and ride thereon as the cross-head moves up and down in the chamber. As the cross-head moves downward, it is evident that it will draw toward the front, thereby bringing its beveled edge toward the opening 2, and beneath the upper portion of the pin-opening 4. The bar 8, is formed of metal, and is of such dimensions as to give it the required strength and weight. The link 15, which is inserted through the opening 2, and rests upon the lower shoulder 16, of the same, has its end lying in the groove or channel 13, the weight of the bar 8, and its cross-head, being sufficient to counterbalance the outer end of the link and support it in whatever position it may be placed.

In coupling, the link being thus arranged in one draw-head, the coupling-pin 3, is placed in the other, with its point resting upon the beveled edge of the cross-head 11, the latter being drawn forward by the inclined walls 7, in the manner already described. The entrance of the link 15, pushes back the cross-head, the slotted end of the bar slipping upon the pin 10. This permits the descent of the pin, which drops through the loop of the link, thus accomplishing the coupling. The cross-head 11, being beveled off at 12, as already described, permits the end of the link to pass underneath and beyond the end of the

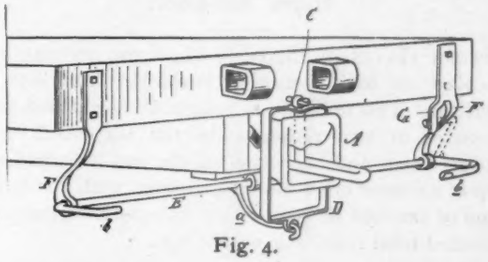


Fig. 4.

SKINNER'S LINK-AND-PIN COUPLER AND UNCOUPLER.

pin before the latter drops off the cross-head, as it will be seen that the push of the coupling-link will cause the cross-head to ride upward upon the curved walls 7, for a short distance before it passes from beneath the pin. By this invention the link may be placed in any suitable position for coupling and retained in that position. As the draw-heads upon different cars are often arranged at different heights from the ground, it is often necessary to incline the link upward or downward to enable it to

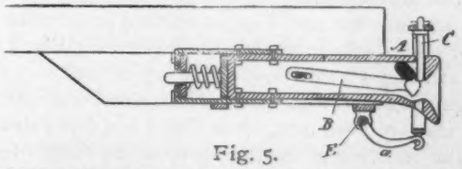


Fig. 5.

SKINNER'S LINK-AND-PIN COUPLER AND UNCOUPLER.

enter the opposite draw-head. In whichever position placed, the weight of the bar 8, and cross-head 11, will hold the parts in the proper position until the coupling is accomplished.

In Figs. 4 and 5 is shown a modification of the device,

by means of which a coupling-pin can be raised, so as to allow of the easy withdrawal of the link, while it can be readily held in its elevated position to prevent coupling. Fig. 4 is a perspective view showing the application of this modified device, and Fig. 5 a vertical longitudinal section through the coupling.

A represents a draw-head, B a gravity-pin, and C a coupling-pin, as before described, and D is a yoke, rectangular in form, placed around the draw-head, as shown.

The upper horizontal bar of the yoke P, is removably secured to the head of the pin C, while the lower horizontal bar is pivotally secured to the arm *a*, which projects outwardly from the rock-shaft E, which is properly journaled in the ends of the brackets or hangers F, as shown, the outer ends of the rock-shaft being bent to form handles *b*. Upon one or both of the brackets F, and preferably forming an integral part thereof, is the stop G.

It is claimed for this device that it obviates the necessity of a train-hand going between the cars to couple or uncouple; that the pin may be controlled from either side, or top of the car; that it operates by gravitation, no springs, gears or fixtures being employed, and that the entire device is simple, inexpensive, efficient in operation and not liable to derangement.

The device is now controlled by the Skinner Car-Coupler Company, of Flint, Mich.

Hayes' Nut-Lock.

JOSEPH HAYES, of Dover, N. H., is the inventor of an improved nut-lock, which is herewith illustrated and described. This nut-lock is designed to be affixed to the fish-plates of two railway-rails, the screw-bolt going through them and the clasp of the nut-lock, and such clasp at its lower edge being in contact with the bottom flange of the rail or that of the fish-plate, whereby it is prevented from revolving on the bolt.

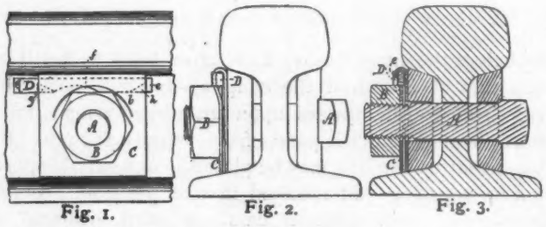


Fig. 1. Fig. 2. Fig. 3.

HAYES' NUT-LOCK.

In the accompanying cuts, Fig. 1 is a front elevation; Fig. 2 an end view, and Fig. 3 a vertical and median section of a nut-lock employing the invention; Fig. 4 a top view, and Fig. 5 a side view, of the key of such lock; Fig. 6 a front view, and Fig. 7 a transverse section of one form of the clasp of such lock, while Fig. 8 is a front view and Fig. 9 an end view of another form of the clasp. Fig. 10 is a view of the clasp shown in Fig. 6 before it is folded at its middle. Fig. 11 is a perspective view of the clasp with the bolt or lock open so that the nut can be turned, and Fig. 12 a similar view of the clasp with the bolt locked.

A is the screw-bolt, and B its nut, the shank of the bolt going through the clasp C. This clasp consists of a rectangular plate, one-half of which is folded at the middle of the plate over the other half, a hole *a*, for the reception of the shank of the bolt being made through each half. In the front half of the clasp there is an arcal slit *b*, which is above and concentric with the hole *a*. The segment of such slit is pressed in or downward against the rear half of the clasp, and is truncated in its upper part, as shown at *c*. A key D, is arranged in the upper part of the clasp, and between its two holders, and directly over and resting upon the top of the truncated segment *d*. This key slides lengthwise to it in the clasp, and is flanged at each end, as shown at

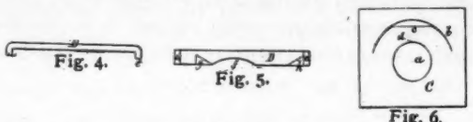


Fig. 4. Fig. 5. Fig. 6.

HAYES' NUT-LOCK.

e, to limit the movement of the key either way. Furthermore, the key at its middle has in it a segmental notch *f*, as shown, whose radius corresponds to that of the slit *b*. It also has two beveled notches *g h*, arranged in it as represented.

On the nut being screwed hard up against the clasp, so

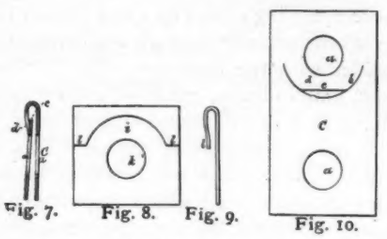


Fig. 7. Fig. 8. Fig. 9. Fig. 10.

HAYES' NUT-LOCK.

as to bring one side of such nut level with the straight portion of the top of the truncated segment, (the arcal slit having a radius a little greater than the extreme radius of the nut) the key can be moved in the clasp, so as to project over the upper face of the nut in a manner to prevent the nut from revolving on the screw, it being understood that the key is thicker than the plate of which

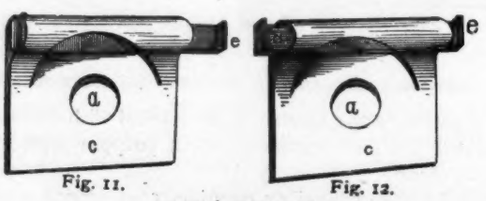


Fig. 11. Fig. 12.

HAYES' NUT-LOCK.

the clasp is made. On the key being thus on the nut, the first half or part of the clasp is to be hammered down so as to enter the notches *g* and *h*, and thereby hold the key from slipping back from locking the nut.

The clasp when formed as shown in Figs. 8 and 9—viz.: as folded near its upper edge, and having an arcal recess *i*, in it, as shown, concentric with the bolt-hole *k*—can be used with the key and the bolt and nut, the parts *l l*, being forced into the notches of the key to hold the key from being accidentally set or moved back.

It is claimed by the inventor that this form of nut-lock

is simple, durable and efficient. It can be applied to the rails of any railway without the necessity of structural changes; it does not require the nut to be turned to an exact angle and it cannot be accidentally deranged. It also serves as a washer.

Raddin's Car-Coupling.

JOHN RADDIN, of Lynn, Mass., is the inventor of an automatic safety car-coupling, which is herewith illustrated and described. Fig. 1 is a vertical longitudinal section of the draw-bar with the pin-and-link in position, and Fig. 2 a vertical section of the same, the pin being held up and the link out.

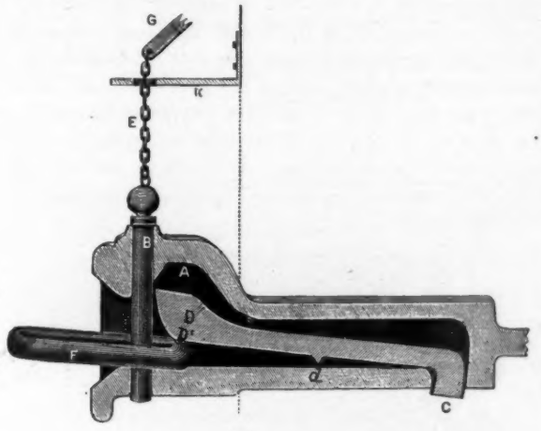


Fig. 1.

RADDIN'S CAR-COUPLING.

A represents the draw-bar, the mouth of which is made in the ordinary manner; but the recess back of the pin is enlarged so as to receive the lever-weight D. This lever-weight D, is pivoted at *d*. The front end of the lever-weight D, is hollowed out and curved, as shown.

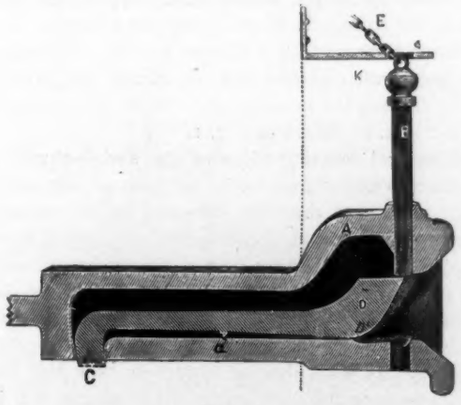


Fig. 2.

RADDIN'S CAR-COUPLING.

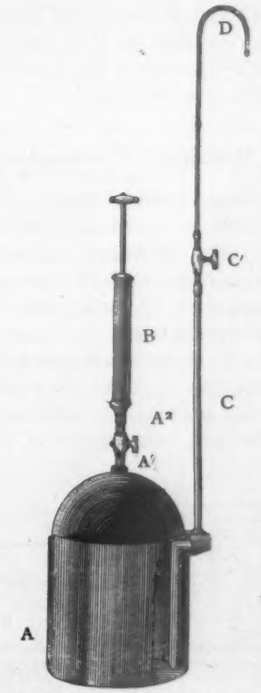
The part D′, of the lever-weight, is adapted to rest upon the end of the link F, and hold it, as shown in Fig. 1. When the link is out, the lever-weight D, falls, as shown in Fig. 2, so that the front end projects forward far enough to receive the end of the pin B, and hold it up; but when the link F, enters it will throw up the lever-weight D, so that its end will pass out from under the pin and allow it to drop.

It is claimed by the inventor that his device forms a simple, durable and efficient coupling; that it is automatic in its action, and that going between the cars is avoided; that it is unvarying in its action, and inexpensive in construction and application; that cars furnished with the coupling will couple with cars not so furnished, either on a grade or level, or on a straight or curved track. A device may also be arranged whereby the cars can be uncoupled from either their tops or sides.

The coupling is now in successful use on a number of cars on the Boston and Maine Railroad.

Andrews' Long-Distance Lubricator.

HARRISON A. ANDREWS, of Conneaut, O., is the inventor of a long-distance lubricator, which is herewith illustrated and described. The device is intended to be used in lubricating line-shafts and other machinery that cannot be easily reached, and the inventor has also provided a form of the device especially applicable for oiling distant



ANDREWS' LONG-DISTANCE LUBRICATOR.

parts of a locomotive and car-axles on long runs at high speed. The accompanying cut is a view of this form of the device with the lower part of the reservoir broken away.

A is a reservoir, of any desired form, and of suitable size to be easily handled, and is provided with a nipple A′, having an inlet-port, within which is located a stop-cock A^2. To the nipple A, is attached an air-pump B, by which air is forced into the reservoir. The reservoir is provided with an outlet-pipe C, arranged preferably near its upper end, and provided with a stop-cock C′, and adapted to support a pipe of sufficient length to reach

the places to be oiled. A discharge-pipe or nozzle D, is attached to the outlet-pipe, and is bent downward over each shaft, so as to discharge the oil into the cups, holes, or gearing. Air is forced into the reservoir until the pressure is sufficient to force the oil through the pipe to the shaft. The flow is regulated by the stop-cock C'.

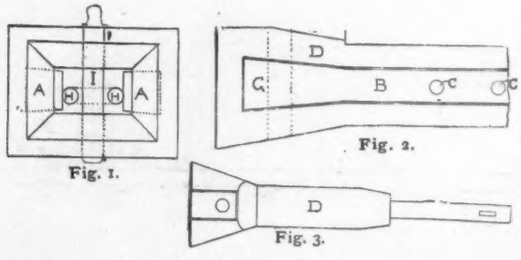
A stop-cock is placed between the air-pump and the reservoir, which may be closed and the pump removed entirely during usage, the pressure of the air remaining nearly the same. The reservoir A, is made of one piece of metal, and has a dome-shaped top, which terminates in the nipple A', which performs the double office of a valve-seat for the stop-cock or plug-valve A^2, and a means of attachment for the pump-barrel. The lateral outlet-pipe C, is also integrally formed with the body of the reservoir, and serves as a means of attachment for the discharge-pipe D.

As the delivery pipe can be bent or constructed in any form and extended to any distance, the lubrirator is especially adapted for all places difficult of access or dangerous to reach by ordinary lubricators. The device is contructed entirely of brass and in the most substantial manner.

By means of this construction and arrangement of parts the inventor claims that he has provided a lubricating device which is free from the complication of parts which is found in ordinary lubricators.

Whitmore's Car-Coupling.

JOHN WHITMORE, of Salem, Mass,, is the inventor of a new form of car-coupling, which is herewith illustrated and described. The invention relates to that class of automatic car-couplings in which the coupling-pin when not in use is supported by spring-jaws that are adapted to be opened or spread apart by the entering link, so as to cause the pin to drop into engagement with the link, thereby coupling the opposite draw-bars, without any necessity of going between the cars, either to drop the pin or hold the link. Heretofore in couplings of this

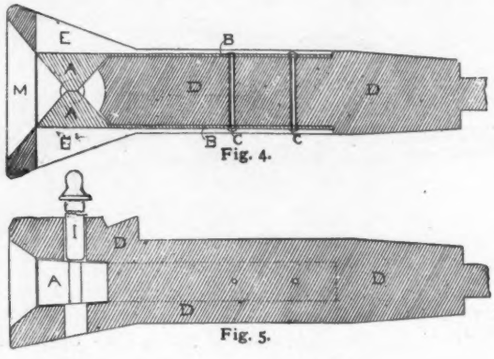


WHITMORE'S CAR-COUPLING.

class the spring-jaws have been provided with longitudinal V-shaped grooves to receive and hold the link in a horizontal position; but the V-shaped grooves are liable to interfere with the necessary vertical inclination of the link in coupling cars that differ materially in height. To overcome this difficulty and provide as well for guiding the link into place, and also for its vertical inclination in coupling cars of different heights and its necessary lateral inclination and play while the cars are in motion, the inventor makes the pin-supporting jaws wedge-shaped and with continuous vertical surfaces at their meeting edges without grooves or recesses. By this means a wedge-shaped opening is presented toward the mouth of the draw-head, whereby the link is surely guided to its place without regard to varying elevations of the draw-bars. The continuous vertical meeting edges of the jaws permit the link to have any required vertical inclination, and the spaces at the front and rear of the wedge-shaped jaws allow the necessary lateral inclination or play of the link in turning curves.

In the accompanying cuts, Fig. 1 is an end view of the improved car-coupling; Fig. 2 a side view of the draw-bar; Fig. 3 a plan of the same; Fig. 4 a horizontal longitudinal section, and Fig. 5 a vertical longitudinal section of the draw-bar, showing the coupling-pin supported by the spring-jaws.

The draw-bar D, is made with a flaring mouth M, as usual, and is cored on each side at E E, to admit of the lateral yielding movement of the wedge-shaped jaws A A, which are formed on or attached to spring-arms B B, that are secured to the sides of the draw-bar by means of bolts or rivets C C, or otherwise. The jaws A, and springs B,



WHITMORE'S CAR-COUPLING.

are preferably made of steel. It will be seen that the two opposite wedge-shaped jaws A A, are so arranged that the force of the springs B B, will keep the edges of the jaws in contact, thus forming a support for the coupling-pin I, until the entrance of the link H, spreads the jaws apart, thereby causing the coupling-pin to fall into engagement with the link, as shown in Fig. 1.

The vertical meeting edges of the wedge-shaped jaws are formed without grooves or recesses of any kind, and in such a manner that the jaws will be in contact with each other throughout the length of the edges when the link is withdrawn. These continuously-vertical meeting edges of the yielding jaws A, enable the link H, to assume and maintain any required vertical inclination, to accommodate itself to inequalities in the height of the opposing draw-bars. It will also be observed that the wedge-shaped spaces in the draw-bar at the front and rear of the wedge-shaped jaws permit the link to turn freely in a horizontal direction between the yielding jaws to any required inclination in turning curves, while the wedge-shaped space or opening in front of the jaws insures a proper guiding of the link into place when the draw-bars are brought together in the act of coupling.

This form of coupling is claimed by the inventor to be simple, durable, and efficient, and not liable to injury or derangement.

Wilkinson's Automatic Switch-Signals.

ALGERNON L. WILKINSON, of Huntsville, Ala., is the inventor of two improved automatic switch-signals for railways, which are herewith illustrated and described. In the accompanying cuts, Figs. 1 and 2 refer to the first device, and Figs. 3 to 10, inclusive, to the second.

The object of the first device is to warn the engineer on approaching trains of an open switch, or that the switch is turned to register the rails of the main line with the rails of the siding, and to display the danger-signals at the proper height from the ground and at such a distance from the switch in opposite directions that the approaching train may be brought to a stop before reaching the switch. Another object is so to connect the signals with the rails that they cannot be moved to the siding without displaying the danger-signals.

Fig. 1 is a plan view of this device, certain parts being shown in section and the rails of the main line being represented as registering with the side rails, and Fig. 2 a vertical sectional view of the same, showing the signal-shafts in position to indicate the main track clear.

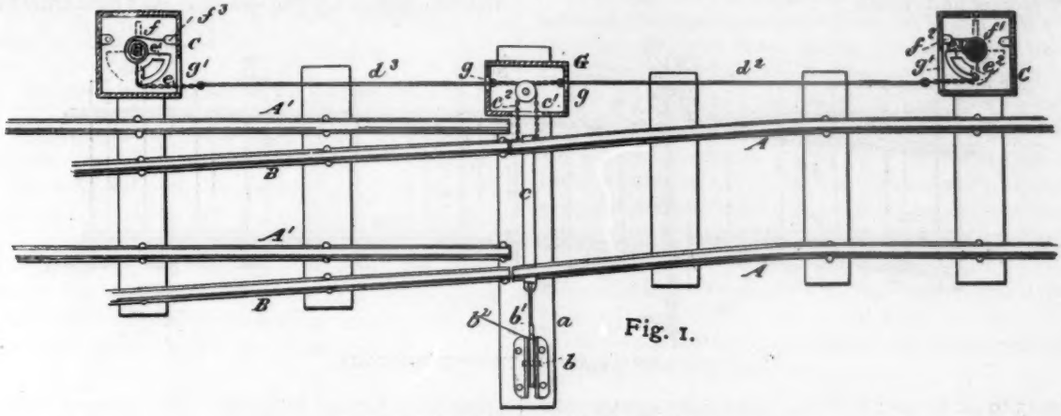


Fig. 1.

WILKINSON'S AUTOMATIC SWITCH-SIGNALS.

A and A′ represent the main line rails of a railway-track, and B the side rails. An ordinary switch-frame b, having a pivoted switch-bar b^2, is secured to one end of the long tie a, in the usual manner. A cross-bar c, is secured to the under side of the rails A, near their ends, and a connecting-rod b', connects the lower end of the bar b^2, with the cross-bar c. A box G, is secured to the outer end of the tie a, within which are pivoted, one above the other on the same bolt or shaft, two pulleys d and d''. Two chains c' and c^2, are attached to a rail A, at or about the outer end of the bar c, these chains passing into the box G, about the pulleys d and d'', in opposite directions, and being severally connected with rods d^3 and d^2, as shown. The outer and further ends of the rods d^3 and d^2, are severally connected by chains e and e^2, with angular plates e' and e^3, made fast to the vertical shafts which hold the signal-plates, the latter being usually colored white on one side and red on the other for readily distinguishing them.

D indicates the vertical shafts holding the signal-plates D′, each of these shafts resting in a socket in a tie, on which rests the casing C, or in a socket in the bottom of the casing. Each of the plates e' and e^3, is triangular in form, (except that its outer edge forms the segments of a circle) and is rigidly attached at its inward angle or corner to the signal-shaft D, the outer or curved edge of the plate being grooved to receive a chain connecting one corner of the plate with the rod extending to the box G, as seen in Fig. 1. A coiled spring $f\,f'$, is attached to each of the signal-shafts D, and also to the casing C, in such a manner as to turn the shaft against the tension of the rods d^3 and d^2, when the rails A, are shifted to register with the side rails. The casings C, having reduced upward extensions C′, inclose severally the lower part of each signal-shaft and attachments, as shown, the shaft extending through an aperture in the top, and the casing having an aperture for the connecting-chain, so that the parts inclosed are properly protected from the weather and from being injured or having their operation obstructed.

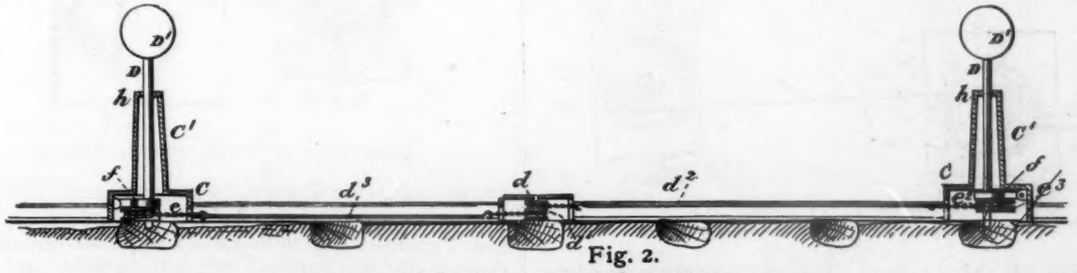


Fig. 2.

WILKINSON'S AUTOMATIC SWITCH-SIGNALS.

The operation is as follows: When the operator, through the switch-bar b^2, and bar c, moves the rails A, to register with the side rails, the rods and chains connecting the rails A, with the angular plates on the signal-shafts are drawn and

turn the shafts, so that the signal-plates are turned from their position in line with the main line of rails to positions at right angles thereto. When the switch-rails are moved back to register with the rails of the main line, the signals D′, are immediately returned to their first positions by the springs f and f', acting on the shafts D, and turning the same, the plates e' and e^3, moving with the shafts and drawing the connecting-chains, the parts of which next to the angular plates sink in the grooves and are held in proper position. The simple construction of the shafts with grooved angular plates and actuating-springs f and f', renders the operation of the device more prompt and certain.

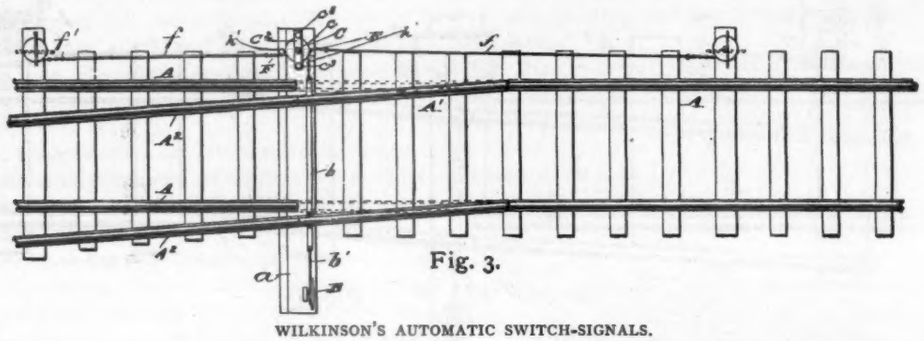


Fig. 3.

WILKINSON'S AUTOMATIC SWITCH-SIGNALS.

Figs. 3 to 10, inclusive, of the accompanying cuts refer to the second device. The general object of this invention is to connect the signals with the switch in such a manner that any movement of the latter, either by design or accident, will serve to set the signal; and its special object is the provision of means whereby expansion and contraction, incident to changes of temperature, of the rods or wires which connect the signals, their operating devices and the switch, is overcome, and all danger arising from the possibility of the signals becoming set, displayed, damaged, or inoperative through the expansion or contraction of the connecting rods or wires is avoided.

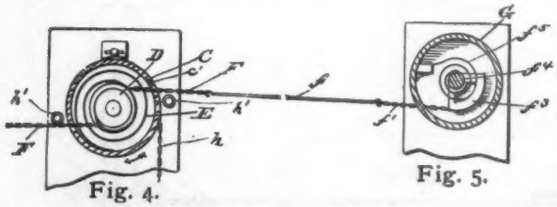


Fig. 4. Fig. 5.

WILKINSON'S AUTOMATIC SWITCH-SIGNALS.

Fig. 3 is a plan view of a portion of a railway provided with this improved device; Figs. 4 to 7, and Fig. 9 are detached detail views of parts of the improvement; Fig. 8 shows a modification, and Fig. 10 is an enlarged detail view of parts of the invention.

A represents the track of the main line of a railway, and A′ a switch connecting such main line with a side track A^2. The switch A′, is provided with a switch-lever B, connected by means of a rod or link b', to the bar b, which holds the switch-rails at proper distance apart. C represents a circular box or case, formed of metal and mounted upon a stud c, projecting upwardly from one end of the cross-tie a, which supports the sliding or free end of the switch. The case C, is free to turn upon the stud c, and serve as a drum upon which the chains leading to the signals may be wound. C^2 represents a flat bar of metal placed above the revolving case C, and connected to the cross-tie by bolts or rods c^3, as shown. The upper end of the stud c, passes through and is supported by the plate C^2. D represents a drum loosely mounted upon the stud c, within the case C. E represents a coiled spring placed within the case C, near the top thereof, and connected at its opposite ends to the drum D, and the box or case C. F represents flat open-linked chains, one end of each of which is connected to the drum D, upon opposite sides thereof, as shown. The chains F, pass outwardly through apertures c', formed in the case C, at opposite sides thereof, and are connected to one end of the signal wires or rods f. The opposite ends of the rods or wires f, are connected by chains f', to a segment f^3, secured to the lower end of the signal-supporting shaft f^4, to the top of which shaft the signal is attached. The signal proper is normally kept in the same plane as the rails by a coiled spring f^5, attached to the lower end of the shaft within

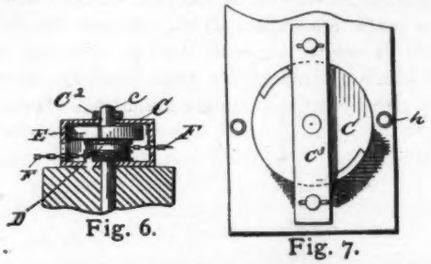


Fig. 6. Fig. 7.

WILKINSON'S AUTOMATIC SWITCH-SIGNALS.

the inclosing-case G, which is of metal, preferably circular in cross-section, and holds the segments f^3, and coiled spring f^5. The signal-shaft passes downwardly through the case and into the cross-tie below, while the chains f', pass through the side of the case to the rods f. The construction of the device attached to the signal-shaft are similar to those shown in the first-described switch-signal, and operate in a similar manner. The case C, is rotated by a chain h, one end of which is connected to the case, the opposite end being secured to the free end of the switch, whereby when the switch is moved, the case C, will be drawn around and serve first to engage the V-shaped notches c', with the chains and then to wind the chains F, upon its outer surface, in which operation the case C, will be aided by small chain-rollers h', mounted upon studs projecting upwardly from the tie at

each side of the case, and about which rollers the chains pass. The rotation of the case draws upon the chains F, and rods *f*, and thereby turns the signal-shaft and displays the signal attached thereto, as will be readily understood. When the switch is in its normal closed position—*i. e.*, registering with the main line—the rods or wires *f*, and chains F, pass in a direct line from the drum

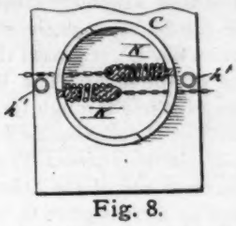


Fig. 8.

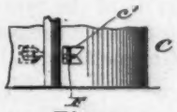


Fig. 9.

WILKINSON'S AUTOMATIC SWITCH-SIGNALS.

D, to the segment upon the signal-shaft, as shown in Figs. 4 and 5, in which position the chain F, does not touch the side walls of the aperture *c'*, in the case C, through which it passes, and can therefore pass freely in and out through the aperture; and inasmuch as the coiled spring E, connecting the drum D, to the case C, is weaker than the coiled springs f^5, upon the signal-shaft, it follows that any expansion of the rods or wires *f*, will turn the drum D, without turning the signal-shaft.

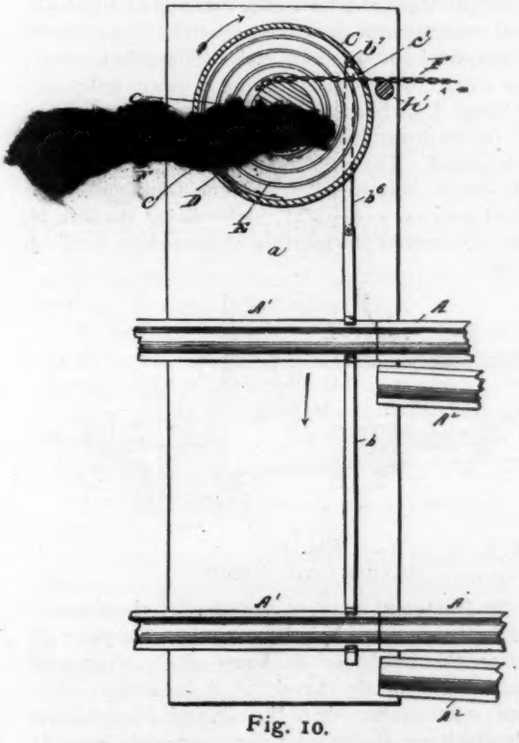


Fig. 10.

WILKINSON'S AUTOMATIC SWITCH-SIGNALS.

To lock the chains F, to the case C, when it is desired to rotate the latter, the following means are employed: One of the side walls of the aperture *c*, through which the chain passes, is made V-shaped, (see Fig. 9) and although the chain, when the case C, is in its normal position, passes freely in and out of the aperture, yet, when the case is rotated in the direction of the arrow, (see Fig. 9) the V-shaped side wall of the aperture *c'*, takes into one of the links of the chain as it passes about the roller *h'*, and thus holds it firmly clamped in position to be wound upon the outer surface of the case C. The clamping of the chain F, by the V-shaped side wall of the aperture *c'*, is shown by dotted lines in Fig. 9. In lieu of the drum D, and coiled spring E, the chains F, may be attached to spiral springs K, located within and attached to the side walls of the case C, as shown in Fig. 8.

The apertures *c'*, in the side walls of the case C, shown in Fig. 8, are similar to those shown in the walls of the case C, in Figs. 4 and 6, the chain being held and clamped in a similar manner. Backward rotation of the case C, to its normal position when the switch is returned to the main line is caused by the spring f^5, attached to the signal-shaft, as will be readily understood. If desired, however, such backward rotation of the case may be caused by a rigid connection between the rail-coupling link *b'*, and the case, as shown in Fig. 10, in which the link *b'*, is connected by a rod b^6, with a crank-pin b^7, projecting from the lower surface of the case C, near one of its side edges. In lieu of the device here shown, a rack-bar may take the place of the rod b^6, the teeth of which engage with a gear-pinion secured to the lower surface of the case.

The inventor claims for both of his devices the merits of simplicity and reliability.

Pflaum's Metallic Piston-Packing.

NICHOLAS PFLAUM, of Port Jervis, N. Y., is the inventor of an improved metallic piston-packing, the construction and operation of which are shown in the accompanying cuts. Fig. 1 is a plan view, partly in section, of one of the improved piston-packings; Fig. 2 a side elevation of the same, part being broken away, and showing a part

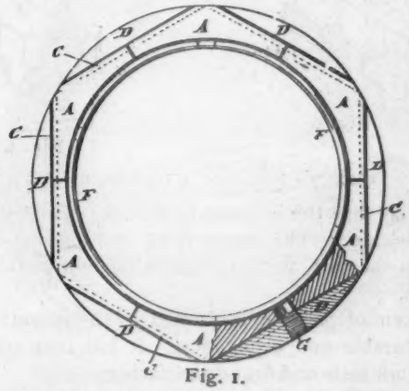


Fig. 1.

PFLAUM'S METALLIC PISTON-PACKING.

of the cylinder in section; Fig. 3 a perspective view of one of the exterior segments, and Fig. 4 a perspective view of one of the interior angular blocks.

A represents the interior blocks, the exterior faces of which are angular, and have their apices rounded off upon the arc of the circle of the interior surface of the cylinder B, in which the packing is to be placed. In the central parts of the outer faces of the angular blocks A, are formed grooves C, as shown in full lines in Figs. 2 and 4, and in dotted lines in Fig. 1. The interior faces of

the angular blocks A, are concaved upon the arc of a circle, as shown in Figs. 1 and 4.

D are plane convex segments, upon the central parts of the plane inner surfaces of which are formed tongues E, of such a shape and size as to fit into the grooves C, of the angular blocks B. The outer faces of the segments D, are convexed upon the arc of the circle of the interior surface of the cylinder B, in which the packing is to be placed, The packing is held out against the inner surface of the cylinder by open ring-springs F, placed within the packing, as shown in Figs. 1 and 2. With this con-

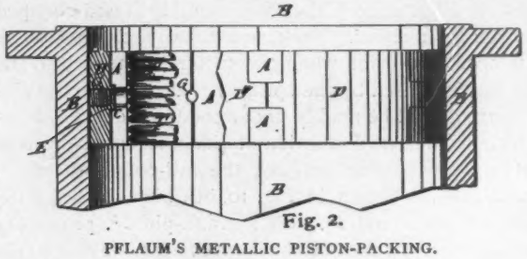


Fig. 2.

PFLAUM'S METALLIC PISTON-PACKING.

struction the outer surface of the packing as it wears will always retain its circular form, and will thus always remain in close contact with the inner surface of the cylinder. Through the centers of the segments D, are formed radial perforations G, which are extended through the adjacent ends of the angular segment A, as shown in Figs. 1 and 2.

The packing, when in use, is secured between the piston-head and the follower in the ordinary manner, and which close up the opposite sides of the packing and form a chamber. The interior of the piston-packing A D, is designed to be filled with tallow, which is slowly melted by the heat, and gradually escapes through the perfora-

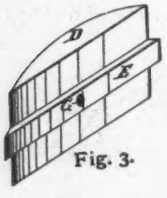


Fig. 3.

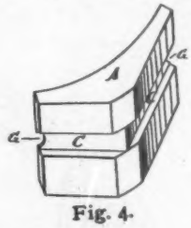


Fig. 4.

PFLAUM'S METALLIC PISTON-PACKING.

tions G, so that the inner surface of the cylinder will be kept lubricated. The piston-head and follower are not shown in the cuts, as there is nothing new in their construction.

This form of packing is claimed by the inventor to be simple, durable and economical. It has been subjected to thorough tests and found satisfactory.

George N. Veritzan, of 223 Bowery, is the New York agent for the device.

Buckman's Car-Coupling.

THOMAS E. BUCKMAN, of Jacksonville, Fla., is the inventor of an improved form of car-coupling, which is herewith illustrated and described. In the accompanying cuts, Fig. 1 is a longitudinal sectional elevation of the coupling in the position which it has when the cars are coupled; Fig. 2 a similar view showing it in position ready for coupling; Fig. 3 a plan view of the same, and Fig. 4 a plan view of the link.

The draw-head A, is provided with a stem B, projecting from its rear end and running through the plates K and D, and the spring C, the stem also passing through a cross-piece E, uniting two side pieces F, between which the cross-piece D, is held. The cross-piece E, has side-pieces E′, against the front ends of which the cross-piece D, can strike. A key B′, is passed through the stem B, behind the cross-piece D, and a key B^2, is passed through the stem B, at the rear end of the same. The key B^2, prevents the stem being drawn entirely through the cross-piece E, to the front, and the key B′, takes up the forward draft. The bottom edges of the side-pieces F, are inclined downward toward the front end of the draw-head, and the side-pieces are united by a cross-piece G, secured

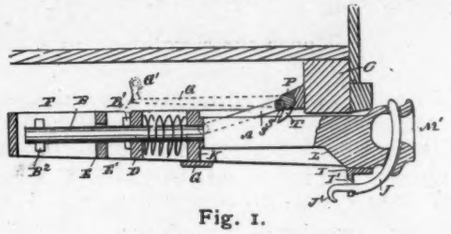


Fig. 1.

BUCKMAN'S CAR-COUPLING.

to the bottom edges to hold up the rear end of the draw-head and resist the downward thrust of the link-frame S. On the under side of the front ends of the side-pieces E, is bolted a flat cross-piece H, having a downwardly-projecting flange I, with an a[redacted] hook J′, on the lower inn[redacted] pin J, is passed. The draw-head [redacted] bevel L, on its bottom edge near the front end. [redacted] draw-head also has a cavity M′, for receiving the link N, and a slightly-curved pin-aperture M, extending from top to bottom.

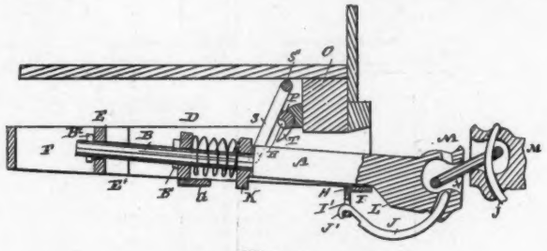


Fig. 2.

BUCKMAN'S CAR-COUPLING.

O is the front end beam of the car, and the distance from the bottom edge of this beam to the cross-piece H, is equal to the height or thickness of the draw-head directly in front of the bevel L. A rock-shaft P, is journaled on the under side of the car, and is provided at the ends which are at the sides of the car with levers Q, which can be held or locked in place when lowered by latches Q′, pivoted on the sides of the car. The rock-shaft has a longitudinal groove R, for receiving the forward end of a rectangular link or frame S, which has its rear end pivoted in the rear end of the draw-head and presses against the draw-spring plate K. The rock-shaft has a cam-arm T, which can act on the frame S.

The operation is as follows: When the car is coupled,

the front part of the draw-head rests on the cross-piece I, the pin J, is passed up through the draw-head and holds the link N, the forward end part S′, of the locking-link S, being in the groove R, of the rock-shaft P, and prevents pulling the draw-head outward.

When it is desired to uncouple, the handle Q, is swung up to turn the rock-shaft P, in such a manner as to cause the cam T, to strike the front end of the frame S, and swing the same upward, thereby releasing the draw-head,

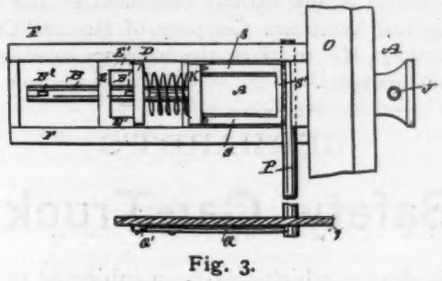


Fig. 3.

BUCKMAN'S CAR-COUPLING.

which can be pulled out a certain distance by the strain on the link. The bevel L, slides down the cross-piece H, the front end of the draw-head descends, and the pin J, swings down and releases the link N. When the cars couple, the draw-head A, is forced inward and upward by the opposing draw-head, the bevel L, sliding up the cross-piece H, whereby the pin J, is swung up and through the draw-head and link. The draw-head is pushed back

Fig. 4.

BUCKMAN'S CAR-COUPLING.

so far that the cross-piece S′, can drop into the groove R, and thus lock the draw-head in place.

The inventor claims this form of coupling to be automatic in its action in coupling, that it couples to varying heights of draw-heads, and that it uncouples under strain on the link and without the necessity of backing the engine.

Gouilloud & Page's Journal-Bearing.

LOUIS GOUILLOUD and CHARLES PAGE, of Montreal, Canada, are the inventors of an improved journal-bearing, which is herewith illustrated and described. The device is applicable to the rolling-stock of railways, including freight and passenger-cars, sleepers, and the tenders of locomotives, and to street-cars of all kinds; and its object is to reduce the amount of wear between the bearing-surface of the journal and that of the brass, and at the same time to provide perfect lubrication of these parts.

In the accompanying cuts, Fig. 1 is an end sectional view of the bearing, and Fig. 2 a side sectional view.

The journal consists of a cast-steel cylinder or sleeve B, lying on the axle A, and under the brass C, which sleeve takes all the friction of the brasses and saves it from the axle. The diameter of the sleeve being considerably greater than that of the axle, the sleeve dips into oil in the bottom of the box receiving a thorough coating of the same, inside and out, thus copiously lubricating the brasses, and largely extending their life, without waste of oil as at present.

None of the weight bears on the cogs, which are $\frac{1}{16}$ of an inch short of touching; the weight is carried entirely by the sleeve and axle on each side of the gears. The axle and sleeve revolving together, and at the same speed and in the same direction, the axle sustains no friction, and consequently no wear. The diameter of the axle at present is made larger than absolutely necessary in order to allow a margin for wear. There being no wear of the axles by this system, or deterioration through heating,

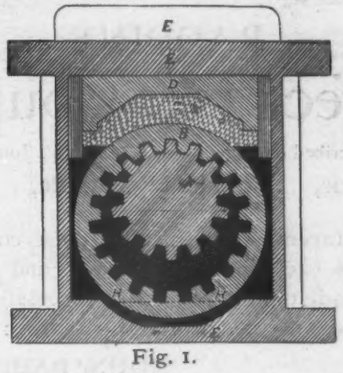


Fig. 1.

GOUILLOUD & PAGE'S JOURNAL-BEARING.

they can be made of smaller diameter, giving favorable leverage—a very important factor in the hauling power required. On the axle now in use, the collar cuts into brasses, and uses them up; and the vertical part of the collar, which bears on the end of the brasses, frequently running dry or without oil, besides wearing the brasses, is a fruitful source of hot-boxes; it being admitted that it is at this point that the heating almost invariably commences.

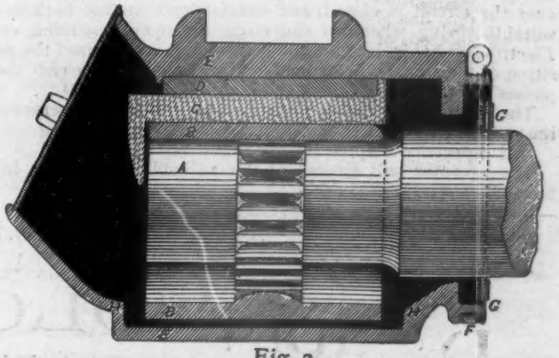


Fig. 2.

GOUILLOUD & PAGE'S JOURNAL-BEARING.

With this form of journal this collar is done away with, a flange cast at the end of the brass doing its work. Waste for packing being entirely dispensed with removes another frequent cause of hot-boxes, waste and oil being combustible of themselves even without the friction of the axles. The dust-guard shown at F and G, in the cuts, is not essential to the journal, but its use is recommended as the desirability of excluding dust from the boxes is well known.

The following advantages in this form of journal-bearing are claimed by the inventors: 1. Ample, abundant and perfect lubrication, uniform, and at all times and under

all circumstances reliable. 2. Greatly extended duration or life of bearings or brasses which by use of this journal are increased at least six fold. 3. Saving of axles, on which there is no friction. 4. Entire saving of waste as packing. 5, large economy in oil. 6. Hauling power required materially diminished, a point the importance of which it is difficult to overestimate. 7. All danger of hot-boxes or heating, and the expense and detention of cars resulting therefrom, is completely obviated. 8. Danger of cracked wheels from expansion of axles by heating removed. 9. Saving of labor. 10. The peculiar balanced action of the sleeve on the axle gives an elasticity to the movement of the trucks, greatly facilitating the starting of the train; practical experience having demonstrated the fact that a train can be *started* with little or no more power than that required to haul it. 11. The simple, reliable and thoroughly substantial nature of the journal, which will last the life of the car, and can be sent on extended "through business" with perfect confidence as to the result.

The journal has been subjected to severe and exhaustive tests with passenger and heavy freight-cars, and has in every case given satisfactory results.

The device is now entirely controlled by the Union Bearing and Lubricator Company, of Montreal Canada, and Portland, Me., to whom the inventors have assigned their patent-rights.

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Perfect Car-Coupler.

(Described on page 317 of this month's JOURNAL.)

Automatic, Simple, Durable, Reliable.

The inventor will furnish these couplers for trial at $6 each, including royalty, and no charge will be made unless they prove successful.

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For Railway and other Signals.

By means of this improved instrument, a full description of which was published in the November JOURNAL, the armature which carries the signal will be turned into one position whenever the circuit is closed, and automatically turned back by a suitable spring whenever the circuit is open, provided one Electro-Magnet is used; while if two Magnets are used the position of the signal will depend entirely upon the current that passes through either one of the Magnets.

The Magnet can also be placed in any position to operate all the different kinds of signals either in revolving or lifting.

It is especially adapted for use in railway signaling.

The inventor will dispose of this valuable patent at a low figure. Address

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It can be applied to Freight-Cars of all kin[redacted] Passenger and Sleeping-Cars, and to Locomotives and Tenders.

A Full Illustrated Description of the Car-Truck appeared in the AMERICAN RAILROAD JOURNAL for October, 1885.

Full particulars will be furnished by addressing:

S. DAVIS,

P. O. Box, 447. MONTREAL, CANADA.

WOLCOTT'S

PATENT

Dumping-Car and Car-Dump.

This invention furnishes a means for unloading Grain, Coal, Ores, and other Freight, from Platform, Gondola or Box-Cars, and by its use one or more Cars can be dumped at the same time by an extended Dump-Track which may be coupled out to any desired length.

A full description of both devices, with their application, was published in the November JOURNAL.

For particulars, address the Inventor and Patentee,

ANSON WOLCOTT, Wolcott, Ind.

General Offices THE ROTE AUTOMATIC BRAKE COMPANY,

Mansfield, Ohio, *November 3d, 1884.*

To the Westinghouse Air Brake Company, Pittsburgh, Pa.:

Gentlemen:—Understanding from your published announcements that you recommend your brake for freight-train use we respectfully invite you to a complete and searching public test of its merits in competition with the *Rote Automatic Brake.* This test to be made in so complete and critical a manner as to show all the railroads of the country, as well as the Railroad Commissioners of the various States, which of the two brakes is the one which should be used; for the test will, we are certain, leave no doubt in the minds of any witnessing it.

To insure the proper management of the test we suggest that you choose one person, we another, and these two a third person, all three to be well known as capable and honorable rolling-stock experts, to conduct the test, their expenses to be jointly borne by you and by us.

An invitation to witness the test to be extended to the General Officers of Railroads and all State Railroad Commissioners, to the members of the National Car-Builders Association, and to the Railroad and daily press.

The test to be at such time and place as may be mutually agreed upon, but we suggest that the proper place would be on some road having high grades and sharp curves, so that both brakes may have as hard and complete a test as possible. As it is necessary to make the test searching and complete, and as all railroads wish to increase the length of their trains and only wait for a brake which will enable them to do so, we think each train should be made up of 50, 60 or 70 cars, as you may prefer or, if you think best, of even more cars.

Your company to supply your train and engines, we to supply ours.

The following points, among others, to be considered and reported upon:

Cost of equipping trains.
Simplicity.
Freedom from breakage.
Certainty of action.
Effectiveness.
Cost of maintaining.
"Flatting" of wheels.
Any other points submitted by you or by us in writing to be added to the above.

The brakes or trains are to be tested in every manner and under all conditions which practical railway service may suggest, including yard as well as line service.

[redacted] tests are to be applied to both trains:

[redacted] of the time) run by engineers and crews who have never operated either brake and who are

[redacted] The train [redacted] of the time) to be partly made up (as nearly all freights are everywhere) of foreign cars, which have neither your nor our brake on, so that the cars having your break or ours on shall be widely and irregularly separated from each other.

3d.—The locomotives drawing your train and ours to be exchanged, from time to time, and draw each others trains.

4th.—Two locomotives equipped as so many freight engines and tenders are, with hand-brakes instead of steam or air brakes, are to be substituted for the two engines used in the test part of the time. Any brake which will not work properly if this is done, you will admit, can be of little practical value in actual service.

5th.—From time to time each train is to be stopped and foreign cars (not equipped with either your brake or ours) are to be run into it, at irregular intervals, just as actual service requires constantly.

6th.—In the making up of trains, etc., crews are to be exchanged at random, so that the test may fully illustrate the convenience of operating each kind of brake in actual ordinary service.

7th.—Frequent short runs, stops and quick starts are to be made.

8th.—A series of yard tests are to be made, showing the action, convenience, etc., of the two brakes.

We mention a few necessary tests only, and you and we, as well as the test committee, are to add any number of others, it being distinctly understood that if you decline any test proposed by us, or we decline any proposed by you, it shall be condered an explicit and positive admission of inferiority.

This rule must in every case be strictly observed, namely: *Both brakes must be tested in precisely the same manner,* so that there may not only be absolute fairness, but no room for suspicion even of anything else.

You have been in the brake field a long time, have profited justly and largely from the patronage of railroads, and we are sure will welcome this plan for allowing your patrons and the American public to judge for themselves which brake should come into universal use.

Having proper confidence in the merits of your brake we know you will gladly and promptly accept our proposition herein made, as you must feel that the test will be complete.

The railroad public is a very fair-minded, capable body, and will most thoroughly appreciate and fully recognize the equity and fairness of our offer to you, and, in common with business-like peope everywhere, will naturally (and, we are sure you will admit, properly) consider it a virtual confession of inferiority and a public admission that the Westinghouse Brake is inferior to the Rote Brake and that it is unfitted for general freight service, should you decline or neglect to avail yourselves of the proposition we make you herein.

Permit us to add in closing that we wish to express to you our desire to have this communication received in the spirit in which it is sent, and to have it express to you our wish for a full, fair and searching test of the two articles in the relative merits of which the railroad interest is *primary* and that of the owners even secondary. Respectfully,

THE ROTE AUTOMATIC BRAKE COMPANY,
Per M. D. Harter, President.

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